COPY FOR MR. J. ALLAN ROSS

HYDRO-ELECTRIC INQUIRY COMMISSION

ENGINEERING DATA

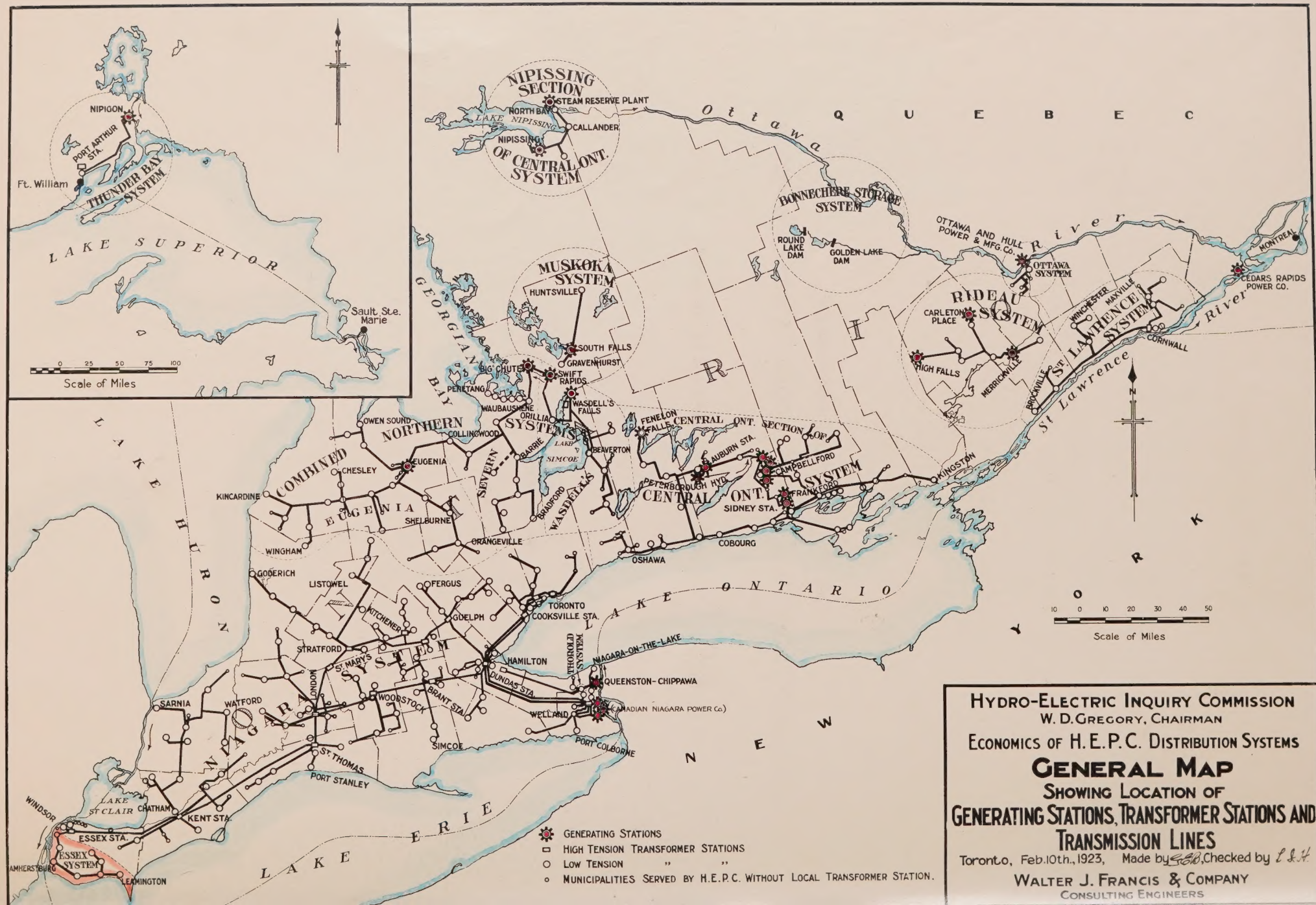
ECONOMICS OF H. E. P. C. DISTRIBUTION SYSTEMS

STUDY OF ESSEX SYSTEM

WALTER J. FRANCIS & COMPANY

CONSULTING ENGINEERS

ESSEX SYSTEM


HYDRO-ELECTRIC INQUIRY COMMISSION
W. D. GREGORY, CHAIRMAN
ECONOMICS OF H.E.P.C. DISTRIBUTION SYSTEMS
GENERAL MAP
SHOWING LOCATION OF
GENERATING STATIONS, TRANSFORMER STATIONS AND TRANSMISSION LINES
Toronto, Feb. 10th., 1923, Made by, Checked by
WALTER J. FRANCIS & COMPANY
CONSULTING ENGINEERS
GENERATING STATIONS
HIGH TENSION TRANSFORMER STATIONS
LOW TENSION " "
MUNICIPALITIES SERVED BY H.E.P.C. WITHOUT LOCAL TRANSFORMER STATION.
Scale of Miles
NIPISSING SECTION OF CENTRAL ONT. SYSTEM
STEAM RESERVE PLANT
NORTH BAY
CALLANDER
LAKE NIPISSING
NIPISSING
THUNDER BAY SYSTEM
NIPIGON
PORT ARTHUR STA.
Ft. William
LAKE SUPERIOR
Sault Ste. Marie
MUSKOKA SYSTEM
HUNTSVILLE
SOUTH FALLS
GRAVENHURST
BIG CHUTE
SWIFT RAPIDS
WASDELL'S FALLS
PERETANG
WAUBAUSHENE
ORILLIA
LAKE SIMCOE
BEAVERTON
GEORGIAN BAY
LAKE HURON
COMBINED NORTHERN SYSTEMS
OWEN SOUND
COLLINGWOOD
EUGENIA
CHESLEY
KINCARDINE
EUGENIA
SHELBURNE
WINGHAM
GODERICH
LISTOWEL
ORANGEVILLE
BARRIE
SEVERN
BRADFORD
WASDELLS
FERGUS
KITCHENER
GUELPH
STRATFORD
ST. MARYS
LONDON
NIAGARA SYSTEM
WOODSTOCK
BRANT STA.
SIMCOE
ST. THOMAS
PORT STANLEY
SARNIA
WATFORD
CHATHAM
KENT STA.
LAKE ST. CLAIR
WINDSOR
ESSEX STA.
ESSEX SYSTEM
AMHERSTBURG
LEAMINGTON
LAKE ERIE
TORONTO
COOKSVILLE STA.
HAMILTON
DUNDAS STA.
THOROLD SYSTEM
NIAGARA-ON-THE-LAKE
QUEENSTON-CHIPPAWA
(CANADIAN NIAGARA POWER Co.)
WELLAND
PORT COLBORNE
LAKE ONTARIO
OSHAWA
COBOURG
FENELON FALLS
CENTRAL ONT. SECTION OF
AUBURN STA.
PETERBOROUGH HYD.
CAMPBELLFORD
FRANKFORD
SIDNEY STA.
CENTRAL ONT. SYSTEM
KINGSTON
BONNECHERE STORAGE SYSTEM
ROUND LAKE DAM
GOLDEN LAKE DAM
OTTAWA AND HULL POWER & MFG. Co.
OTTAWA SYSTEM
Ottawa River
QUEBEC
RIDEAU SYSTEM
CARLETON PLACE
HIGH FALLS
MERRICKVILLE
BROCKVILLE
ST. LAWRENCE SYSTEM
WINCHESTER
MAYVILLE
CORNWALL
MONTREAL
CEDARS RAPIDS POWER CO.
St. Lawrence River
NEW YORK

To face frontispiece.

General Map Showing Location of

Generating Stations, Transformer Stations and Transmission Lines

of the

Hydro-Electric Power Commission of Ontario.

The area outlined in red shows the

Essex System.


Niagara-Electric Inquiry Commission
W. D. Gregory, Chairman
General Map
Showing Location of
Generating Stations, Transformer Stations and Transmission Lines
in the
Province of Ontario.
Scale 1 Inch = 10 Miles.
Compiled by H. E. Vaughan, Toronto.
Copyright 1908 by H. E. Vaughan, Toronto.
Low Tension
High Tension
Steam Generating Stations
Hydro Electric Generating Stations
Transformer Stations
Transmission Lines
Hydro Electric Generating Stations
Steam Generating Stations
Transformer Stations
Transmission Lines
Low Tension
High Tension
Copy

INDEX TO ESSEX SYSTEM

INDEX TO ESSEX SYSTEM

COPY

LIST OF ILLUSTRATIONS

ESSEX SYSTEM

WALTER J. FRANCIS & COMPANY.

COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

Toronto, Ontario,

June 11th, 1923.

Hydro-Electric Inquiry Commission,
W. B. Gregory, Esq., Chairman,
T O R O N T O, Ontario.

re Studies of Engineering Economics of the
Essex System of the
Hydro-Electric Power Commission of Ontario.

Mr. Chairman and Gentlemen,-

In accordance with the letter to your Commission under date of November 4th, 1922, and your confirmation of the general instructions under date of November 15th, 1922, a study has been made of the engineering economics of the Essex System of electrical distribution operated by the Hydro-Electric Power Commission of Ontario. The work has been done under the direct personal supervision of Mr. Frederick B. Brown, M. Sc., M.E.I.C., a partner in the firm of Walter J. Francis & Company, in accordance with your instructions.

The subject has been discussed with Mr. Commissioner R. A. Ross in detail, and, generally, with Mr. Bower, the Secretary of your Commission, and constant communication has been maintained with the officials of the Hydro-Electric Power Commission of Ontario.

The reports of Messrs. Price, Waterhouse & Co. have been used as the basis of the financial figures given herein, and reference has been made to the records of the Hydro-Electric Power Commission of Ontario where it was necessary to do so to prepare the diagrams.

Toronto, Ontario,

June 11th, 1928.

Hydro-Electric Power Commission,
T. H. Hogsett, Esq., Chairman,
TORONTO, Ontario.

re Interim Report Concerning the
Power Rating of the
Hydro-Electric Power Commission of Ontario.

Gentlemen and Commissioners:-

In accordance with the letter to your Commission under date of November 4th, 1927, and your authorization at the general Commission meeting on December 6th, 1927, I might lay before you the results of the examination of the power ratings of electrical distribution systems of the Hydro-Electric Power Commission of Ontario. The work has been done under the direct personal supervision of Mr. Frederick W. Jones, M. Sc., A.M.E.I.E., a graduate in the Fall of 1926 of Queen's University, in association with your Inspectorate.

The matter has been discussed with Mr. Commissioner H. A. Ross in detail, and, generally, with Mr. Jones, the Inspector of Power Installations, and members of the Inspectorate have been associated with the officials of the Hydro-Electric Power Commission of Ontario.

The reports on Barrie, Orillia, Peterborough & Mr. Hope have been sent on the basis of the Commission Firm's given bonds, and it seemed the best way to the issuance of the Hydro-Electric Power Commission of Ontario makes it unnecessary to do so to produce the diagrams.

It is understood that it is not within the scope of the instructions to examine into any of the legal aspects of the System nor to discuss any of the Acts of the Legislature relating to it.

The necessary technical data has required considerable preparation as much of it is only available in the operating records of the Hydro-Electric Power Commission of Ontario. The printed reports contain a part, but these have had to be supplemented by interviews with various officials, and by searching the voluminous records both at the head office in Toronto and elsewhere.

The general plan under which the report of the studies is presented may be outlined as follows:

(1) A short review of the History and evolution of the System.

(2) A brief physical description of the System.

(3) A brief discussion regarding the characteristics of the local market.

(4) A discussion of progressive capital costs.

(5) Statistics regarding progressive revenues for various classes of service, with discussion thereon.

(6) Statistics regarding progressive operating costs and fixed charges, with discussion thereon.

(7) Analysis of the reserve accounts.

(8) Statistics showing progressive and accummulated deficits or surpluses, with discussion thereon.

(9) Analysis of progressive operating records and of unit revenues per horse-power per annum and of unit costs per horse-power per annum.

(10) A brief discussion of the various important points concerning the System.

It is mentioned that it is not within the scope of the instructions to consider the use of the input capacity of the system as a factor in determining the size of the instructions solution to it.

The necessary conditions are the required commercial performance as most by it is only realizable in the operational results of the Ship-training force (reliance on data). The product capacity consists a part, the above has to be supplemented by instructions with various criteria, and by providing the minimum training into as the most effort in Canada and elsewhere.

The general plan upon which the report of the studies is presented may be outlined as follows:

(1) A short review of the [illegible] and evolution of the system.

(2) A brief personal description of the system.

(3) A brief analysis concerning the characteristics of the final result.

(4) A discussion of [illegible] capital costs.

(5) Statistics regarding progressive payment for various classes of service, with discussion thereof.

(6) Statistics regarding progressive operating costs and fixed charges, with discussion thereof.

(7) Analysis of the results achieved.

(8) Qualitative [illegible] and economical [illegible] of analysis, with discussion thereof.

(9) Analysis of [illegible] quantity [illegible] of each [illegible] [illegible] for [illegible] of [illegible] [illegible] [illegible]

The report included herewith as pages 4 to 41 inclusive refers in detail to that portion of the activities of the Hydro-Electric Power Commission known as the Essex System. References are made to the inter-connection of this System with other Systems.

Throughout the report diagrams have been included in the order of the text, while the map included as a frontispiece shows the System generally and its geographical relation to all the other Systems operated by the Hydro-Electric Power Commission of Ontario.

ESSEX SYSTEM

Frederick B. Brown, M. Sc.

Evolution and Development of the System.

In January, 1914, the Essex County Light and Power Company, Limited, which was owned by the Detroit Edison Company, began to deliver power to the Towns of Amherstburg and Kingsville and the Village of Harrow. Through the assignment of rights by the Amherstburg Light, Heat & Power Company, Limited, and the Kingsville Electric Light Company, Limited, it had acquired franchises for the distribution of power in these towns. It continued to extend its system and before the end of 1914 was also distributing power in the Village of Canard River and in the Town of Essex where it had acquired the franchise and rights of the Essex Light and Power Company, Limited. In 1915 transmission lines and distributing systems were built for the Village of Cottam and the Town of Leamington where the franchise of the Leamington Light & Heat Company, Limited, had been taken over. The Essex County Light and Power Company, Limited, supplied these municipalities with power from their steam generating plant near the City of Windsor. When the demand for power outgrew the capacity of this station they arranged with the Canadian Salt Company, Limited, to install steam-turbine-driven generating equipment in the works of the latter company at Sandwich to augment the supply of power.

At the request of the municipalities concerned the Hydro-Electric Power Commission entered into negotiations with the Company for the purchase of the System and on May 22nd, 1918, made an agreement with the Essex County Light and

Hudson County

Prudential St. Newark, N. J.

Technical and Commercial Data.

In January, 1914, the Essex County Light and Power Company, limited, which was owned by the Public Service Company, began to deliver power in the Towns of Harrison and Kearny and the Village of Belleville. Because the analogous and of which by the corporating city, that a power company, limited, and the Kearny Electric Electric Light Company, Limited, is had acquired Transmission for the distribution of power in these towns. It maintained in related its system and before the end of 1914 was also distributing power in the Village of Cranford Park and in the Town of Union which it had acquired the franchise and rights of the Union Light and Power Company, Limited. In 1915 transmission lines and distributing systems were built for the Village of Orange and the Town of Irvington upon the formation of the Independent Light & Power Company, Limited, and have been taken over. The Essex County Light and Power Company, Limited, supplied Orange municipalities with power from their main steam generating plant near the City of Newark. Since the Essex Co. p. may assume the ownership of this station they arranged with the Prudential Gas Company, Limited, to install steam-driven-electric generating equipment in the works of the Gaslight company at Burnham to augment the supply of power.

At the inception of the municipalities concerned the Public-Service Corporation Transmission system is interconnected with the Company for the purchase of its system and so that since 1914, power is purchased from the Essex County Light and

Power Company, Limited, by which the Commission acquired certain of their transmission lines, stations and distributing systems. The purchase price was paid and the transaction completed on June 1st, 1918.

The assets of the Essex County Light and Power Company, Limited, acquired by the Commission were described in the agreement as follows:

(a) The goodwill of the said business.

(b) All the freehold and leasehold lands, easements and interests in the lands owned by the Vendor.

(c) All the plant, machinery, furniture, patents, licenses, stock in trade, stores, goods, chattels, property and effects, to which the Vendor is entitled, or which are in use by the Vendor or to which the Vendor is entitled in connection with the said business.

(d) The franchise, contracts and engagements of the Vendor as set out in Schedule "A" hereto attached and forming part of this agreement, all the rights of the Vendor thereunder and the full benefit thereof, and all other pending contracts and engagements or existing franchises to which the Vendor is or may be entitled in connection with its said business.

(e) All the other property to which the Vendor is entitled in connection with the said business except all the Vendor's cash, promissory notes, book accounts and other bills and accounts receivable to which the Vendor is entitled on the 31st of May, 1918.

From the property described above the Power Company reserved to itself the real estate and substation equipment in the Town of Sandwich, the steam turbine plant installed in the works of the Canadian Salt Company at Sandwich, the

transmission line connecting these two stations, and also the wires connecting the Sandwich substation and the works of the Canadian Salt Company at Windsor, which were in part strung on the poles of the transmission lines sold to the Commission. It also reserved to itself all the stock of merchandise on hand for sale to customers, the intention apparently being to sell to the Commission under the items "stock in trade and stores" only the material on hand for repairs to lines and equipment.

The franchises acquired from the Essex County Light and Power Company, Limited, gave the right to transmit or distribute power in the Townships of Sandwich West, Anderson, Malden, Colchester North, Colchester South, Gosfield North, Gosfield South and Mersea, and in the Towns of Amherstburg, Essex, Kingsville and Leamington. The transmission lines acquired consisted of about 55 miles of 26,400-volt lines, extending over a considerable part of the County of Essex. They connected the transformer and distributing stations in the Municipalities of Leamington, Kingsville, Essex, Amherstburg, Harrow, Cottam and Canard River. A local distributing system was supplied by each of these stations.

The System had been supplied with current at 60 cycles frequency, and it was therefore necessary to make extensive replacements and alterations to the equipment before power could be taken from the Niagara System at 25 cycles. To supply the System while these changes were being made an agreement was entered into with the Canadian Salt Company at the time the System was purchased. By the agreement this Company continued to supply power to the System from the steam turbine plant set up in their works at Sandwich, until such time as the Commission was ready to take power from the Niagara System. The Detroit Edison

Transmission line construction times by statistics, and also the steel condition the number of substations and the needs of the Canadian Pacific Railway, which have a part among in the price of the transmission lines sold to the Commission. It also proposes to limit all the right of condemnation or land for sale to mainterers, the Commission apparently being to sell to the Commission under the lines "which is truly and clearly" only the material on hand for repairs to lines and equipment.

The Commission consisted from the Niagara Falls and Power Company, limited, gave the right to transmit or distribute power in the Municipality of Toronto and Scarborough, Malton, Weston Park, Etobicoke Park, Swansea Park, Oakville Park and Burlington Beach, the Town of Mimico, Long Branch, Etobicoke and Lambton. The transmission lines supplied municipal or about 60 miles of 22,000-volt lines, extending over a considerable part of the County of Peel. They connected the transformer and distributing stations in the Municipalities of Lambton, Etobicoke, Weston, Leaskdale, Burton, Bolton and Queen Street. A local distributing system was supplied by each of these stations.

The System had been supplied with current at 60 cycles frequency, and it was therefore necessary to make extensive replacements and alterations to the equipment before power could be taken from the Niagara System at 25 cycles. To supply the System with these changes were being made on automobiles and motors with the Canadian this Company at the time the System was purchased. By the agreement this Company continued to supply power to the Canadian from the steam turbine plant at Long Branch which is Canadian, until such time as the Commission was ready to take power from the Niagara System. The Service Commission

Company also agreed to supply the Canadian Salt Company with the coal required to operate the steam turbine plant. The price paid by the Commission for this power was 1-3/4 cents per kilowatt-hour.

The required changes to 25-cycle equipment we made in all the stations by February 1st, 1919, and on that date the supply of power from the Canadian Salt Company was discontinued and the System was connected with the Essex transformer station of the Niagara System, and since that date all power has been drawn from that source.

The price paid to the Essex County Light and Power Company for the assets covered by the agreement was $226,000 and this was paid in Hydro-Electric Power Commission of Ontario debentures, guaranteed by the Province of Ontario, as follows:

4% Forty-year Debentures	$200,000
5% Ten-year Debentures	26,000
	$226,000

According to the appraisal of the property made by the engineers of the Commission at the date of the purchase of the System the valuation of the capital assets was divided as follows:

Power System		
Transmission Lines	$104,100	
Distributing Stations	32,780	
Old Plant	4,464	$141,344
Local Distributing Systems		84,656
	Total	$226,000

The 60-cycle equipment which was replaced by 25-cycle equipment when the System was supplied with power from Niagara, was sold, as was also the old plant

and a section of transmission line connecting the Town of Sandwich with the System. The total value of the discarded equipment amounted to $21,425.19 at October 31st, 1921, and this amount has been charged to intangible capital. To offset this charge there were received, when the System was purchased, automobile trucks, office equipment, materials and supplies, which had not been included in the inventory on which the purchase price was based, amounting to $5,806.67. This amount, together with the value of the discarded equipment, etc., which has since been sold, has reduced the intangible capital to $6,885.91 at October 31st, 1921.

The Commission constructed a feeder line to connect this System with the Essex Transformer station of the Niagara System. It has also converted the old steam plant building into an office and stores building and has extended the local distributing systems. The total additions to capital costs since the System was acquired amount to $149,141; of this amount $147,721 was made in 1918 and 1919, $62,216 of which was for new 25-cycle equipment to replace the original 60-cycle equipment.

The Essex System is operated entirely by the Commission both as to transmission lines and local distributing systems. There are no contracts with the municipalities by which the Commission is to supply power at cost. The System, therefore, differs from most of the other systems in that none of the municipalities supplied can be classed as "Hydro Municipalities". There is only one rural district, "Leamington District No. 1", on the System, and this is supplied from the Leamington substation.

and a section of transmission line connecting the Town of Sandwich with the System. The total value of the installed equipment amounted to $11,447.37 at October 31st, 1911, and this amount has been charged to telephone capital to offset bill money Guest was received, when the System was purchased, subsidiary income, office equipment, materials and supplies, which had not been included in the inventory on which the purchaser price was based, amounting to $3,308.67. This amount, together with the value of the diversified equipment, etc., which had since been sold, has reduced the investment actually to $8,888.91 at October 31st, 1911.

The Gosfielden constructed a toll line to connect this System with the Essex Transformer station of the Essex System. It has also constructed to all seven plant building lots in office and shared building and has extended the local distributing systems. The total additions to capital since the System was acquired amount to $12,121; of this amount $17,771 was made in 1910 and 1911, $11,111 of which was for new 10-pair equipment to replace the original 60-pair equipment.

The Essex System is operated entirely by the Gosfielden with no separate toll line and local distributing systems. Since the Gosfielden with the municipalities of which the Gosfielden is to supply power to most the System, therefore, differs from most of the other systems in that none of the municipalities supplied can be classed as "pure municipalities". There is only one rural district, "Gosfielden District No. 2", on the System, and this is supplied from the Gosfielden substation.

 Mr. J. Allan Ross.

Description of the System.

General.

The Essex System may be described as serving the westerly and southerly part of the County of Essex. The transmission lines extend from the Essex transformer station south east of Windsor to Canard River, thence south to Amherstburg, and east from there to Leamington near the easterly boundary of the county. A spur also runs from Kingsville to reach Cottam and the Town of Essex near the centre of the county.

The map included as a frontispiece shows the whole of the transmission systems of the Hydro-Electric Power Commission of Ontario with the location of generating stations, high voltage transformer stations, high voltage transmission lines and low voltage transformer stations clearly indicated, and shows the various systems in their relation to one another. The tinted portion of the map indicates the Essex System.

The map included as page 10 shows the Essex System on a larger scale and also gives the names of the different centres concerned. It also shows the Niagara System which is adjacent to and connected with the Essex System.

Speaking broadly the Essex System consists of transmission lines and distributing lines serving seven municipalities and one rural district.

Sources of Power Supply.

There are now no local generating stations which are used as a source of supply for the Essex System. The entire supply of power for the System is

Description of the Design.

General.

The basic system may be described as serving the everyday and essential part of the family of buses. The transmission lines extend from the three transformer stations (with exit of vehicle to Bunsen street, Bunsen street to Lakeshore, and east from there to Dominion near the existing terminus of the family). A spur line runs from Sherwood to road Station and the then on direct near the limits of the family.

The key between as a [illegible] serve the needs of the transmission system of the Hydro-Electric Power Commission of Ontario with the location of generating stations, high voltage transformer buildings, line voltage transmission lines and low voltage transformer stations clearly indicated, and shows the various systems in their relation to the whole. The dotted portion of the map indicates the Buses System.

The map included in page 27 shows the Bus System as a larger scale and also gives the model of the different bus-bar assemblies. It also shows the Bus System which is adjacent to and connected with the Tram System.

Operating broadly the Bus System serves as transmission lines and interconnecting lines serving substations and the rural district.

Number of Tram Circuits.

There are now in Tram generating stations which are used as a service to supply for the Tram System. The active supply of power for the Tram is


HYDRO-ELECTRIC INQUIRY COMMISSION
W. D. GREGORY, CHAIRMAN
ECONOMICS OF H. E. P. C. DISTRIBUTION SYSTEMS
NIAGARA SYSTEM
(INCLUDING ESSEX AND THOROLD SYSTEMS)
MAP SHOWING LOCATION OF
GENERATING STATIONS, TRANSFORMER STATIONS AND
TRANSMISSION LINES
Toronto, June 11th., 1923. Made by G.E.B., Checked by L.J.H.
WALTER J. FRANCIS & COMPANY
CONSULTING ENGINEERS
GENERATING STATIONS
HIGH TENSION TRANSFORMER STATIONS
LOW " " "
MUNICIPALITIES SERVED BY H.E.P.C. WITHOUT LOCAL TRANS'R. STATION
44,000 TRANSMISSION LINES AND VOLTAGE
Scale of Miles
10 5 0 10 20 30 40
LAKE HURON
LAKE ONTARIO
LAKE ERIE
LAKE ST CLAIR
INTERNATIONAL BOUNDARY
N
NIAGARA SYSTEM
ESSEX SYSTEM
THOROLD SYSTEM
TORONTO
YORK STA.
COOKSVILLE STA.
(ERINDALE STA.)
NOT IN OPERATION
HAMILTON
HAMILTON STA.
DUNDAS STA.
BRANT STA.
KITCHENER
GUELPH
PRESTON
STRATFORD
ST MARYS
WOODSTOCK
LONDON STA.
ST THOMAS STA.
KENT STA.
ESSEX STA.
QUEENSTON-CHIPPAWA
NIAGARA TRANS. STA.
ONTARIO POWER CO.
CAN. NIAGARA POW. CO.
ELECTRICAL DEV. CO.
BUFFALO N.Y.
Owned by Ontario Power Co
Owned by Dominion Gov't
DOMINION SEWER PIPE Co
NIAGARA-ON-THE-LAKE
ST CATHARINES
THOROLD
MERRITTON
PORT DALHOUSIE
GRIMSBY
BEAMSVILLE
PORT ROBINSON
WELLAND
DUNNVILLE
PORT COLBORNE
HAGERSVILLE
CALEDONIA
LYTHMORE
LYNDEN
ANCASTER
COPETOWN
BRANTFORD
WATERFORD
SIMCOE
PORT DOVER
OTTERVILLE
NORWICH
BURFORD
INGERSOLL
TILLSONBURG
BURGESSVILLE
BELMONT
SPRINGFIELD
DORCHESTER
THAMESFORD
THORNDALE
EMBRO
BEECHVILLE
PARIS
AYR
PLATTSVILLE
WOLVERTON
DRUMBO
PRINCETON
ST GEORGE
AYLMER
PORT STANLEY
DUTTON
WEST LORNE
RODNEY
WARDSVILLE
NEWBURY
GLENCOE
MT BRIDGES
DELAWARE
LAMBETH
STRATHROY
BOTHWELL
RIDGETOWN
HIGHGATE
THAMESVILLE
DRESDEN
DOM. SUG. CO.
WALLACEBURG
CHATHAM
BLENHEIM
TILBURY
COMBER
BELLE RIVER
WALKERVILLE
WINDSOR
SANDWICH
CANADIAN SALT Co.
FORT CITY
RIVERSIDE
TECUMSEH
ST CLAIR BEACH
CANARD RIVER
AMHERSTBURG
ESSEX
COTTAM
HARROW
LEAMINGTON
KINGSVILLE
SARNIA
WYOMING
WATFORD
PETROLIA
ALVINSTON
OIL SPRINGS
BRIGDEN
THEDFORD
FOREST
PARKHILL
AILSA CRAIG
GRANTON
EXETER
DASHWOOD
ZURICH
HENSALL
DUBLIN
SEAFORTH
CLINTON
GODERICH
MITCHELL
MILVERTON
PALMERSTON
LISTOWEL
MOOREFIELD
DRAYTON
HARRISTON
WELLESLEY
BADEN
NEW HAMBURG
TAVISTOCK
ELMIRA
ST JACOBS
BRIDGEPORT
HESPELER
GALT
ELORA
FERGUS
ROCKWOOD
ACTON
TERRA COTTA
BRAMPTON
GEORGETOWN
STREETSVILLE
MILTON
COOKSVILLE
BOLTON
WOODBRIDGE
UNIONVILLE
MARKHAM
AGINCOURT
WESTON
MIMICO
NEW TORONTO
PORT CREDIT
WATERDOWN
DOMINION SEWER PIPE Co
4,000
13,200
26,400
110,000

(10)

purchased from the Niagara System of the Hydro-Electric Power Commission and supplied through the Essex transformer station of that System. The Essex System has no high voltage transformer station of its own.

Miscellaneous Power Plants in the District.

As previously indicated in the text the source of supply for the System was originally the steam generating plant of the Essex County Light and Power Company, Limited. This plant was purchased and dismantled by the Hydro-Electric Power Commission, the equipment sold, and the building converted into an office and stores building. There is a steam turbine generating plant in the works of the Canadian Salt Company at Sandwich from which power was obtained for the System until February 1st, 1919, when it was connected with the Essex transformer station of the Niagara System after being changed over to take power at 25 cycles instead of 60 cycles as previously supplied to it. The plant in the works of the Canadian Salt Company is a steam-turbine-driven generating unit of 750-K.W., 3-phase, 60-cycles, 2,300-volts.

Transmission Lines.

The transmission lines of the Essex System consist of about 63 miles of 26,400-volt lines and about 8 miles of 4,000-volt lines as indicated on the map on page 10. These lines are all of wooden pole construction and present no extraordinary features. They were built by the Essex County Light and Power Company in 1914 and 1915 and the tie line to the Essex transformer station of the Niagara System was built by the Hydro-Electric Power Commission in 1918 and

produced from the Niagara Power of the Hydro-Electric Power Commission and supplied through the Power transformer station of that System. The Local System has no high voltage transformer station of its own.

Electrical Power Plant in the Station.

As previously indicated in the main the source of supply for the System was originally the plant providing power of the Niagara Falls Power Company, Limited. This plant was purchased and dismantled by the Hydro-Electric Power Commission, the equipment sold, and the building converted into an office and storage building. There is a large pumping plant in the series of the Canadian Air Company of Toronto from which power was obtained for the Great World War, 1914, when it was connected with the Power transmission lines of the Niagara System after being changed over to high power at 22 cycles instead of 60 cycles as previously supplied to it. The plant in the series of the Canadian Air Company is a steam-turbine-driven generating unit of 750-K.V.A., 3-phase, 60-cycles, 2,300-volts.

Transmission Lines.

The transmission line of the Niagara System consists of about 22 miles of 22,000-volt line and about 7 miles of 6,600-volt line as indicated on the map on page 16. These lines are all of wooden pole construction and pleasing appearance throughout. They were built by the Hydro Electric and Power Company in 1911 and 1912 and the rise to the Power transformer station of the Niagara System was built by the Hydro-Electric Power Commission in 1921 and

1919. It may be noted that the average span is 160 feet whereas the normal span for similar lines on other systems is about 130 feet.

Transformer and Distributing Stations.

The transformer and distributing stations at Amherstburg and Kingsville are brick buildings about 24' x 26' x 18', those at Canard River, Cottam, Essex and Harrow are pole type stations, and the station at Leamington is an outdoor steel structure. At Amherstburg, Kingsville and Leamington the voltage is reduced to 4,000, at Essex and Harrow to 2,300, and at Canard River and Cottam to 230 volts for local distribution.

The stations are all of small capacity, Amherstburg being the largest with transformers of 300-K.V.A. capacity and Canard River and Cottam the smallest with 25-K.V.A. capacity. The total transformer capacity of all the stations amounted to 1,025 K.V.A. on October 31st, 1921. The details of the different stations are given in the table below for that date.

Table of Transformer Stations

Location	K.V.A. Capacity	Voltage	
		H.V.	L.V.
Amherstburg	300	26,400	4,000
Canard River	25	26,400	230
Cottam	25	26,400	230
Essex	150	26,400	2,300
Harrow	75	26,400	2,300
Kingsville	225	26,400	4,000
Leamington	225	26,400	4,000

Local Distributing Systems.

It is stated that no contracts have been made between the Hydro-Electric Power Commission and the municipalities supplied with power by the Essex System. The Commission continues to operate the distributing systems and to supply power under the franchises granted to the Essex County Light and Power Company or assigned to it by other companies, all the rights of these franchises having been taken over by the Commission when the System was bought from the Essex County Light and Power Company. The accounting for the municipalities of the Essex System is therefore in the general accounts of the Commission for the System, and the details for the various municipalities are not given in the annual reports.

Characteristics of Market.

Population Served.

The latest figures available, those for 1921, give the population of the towns on the System as follows:

Amherstburg	2,500
Essex	1,470
Kingsville	1,827
Leamington	3,668
	9,465

It is stated by the Hydro-Electric Power Commission that the total population of the district served is about 10,500, the population of Canard River, Harrow, Cottam and the First Concession district would therefore be about 1,000

Local Distribution Centers.

It is ironic that so industrial here been made aware the Eyer-Cleveland Power Commission and the municipalities supplied with power by the Sand Dunes. The Commission continues to operate the distribution systems and is merely power under the contractual operated at the Lake County Light and Power Company, as without so it is not "completely" all the values of those Distribution Centers have taken over by the Municipalities. The system was bought from the Lake County Light and Power Company. This commission for the municipalities of the Lake District is directors in the general management of the municipalities, the system, and the solution [illegible] are not given in the annual report.

Substations or Centers.

Municipal Centers.

The table figures available, taken from 1921, give the population of the towns on the system as follows:

Ambertsburg	2,800
Mason	1,470
Kingsville	1,827
Sandsville	[illegible]
	9,488

It is stated by the Eyer-Cleveland Power Commission that the total population at the district served is about 12,000. The population is spread Ambertsburg, Kingsville and the Tyrel Township District small towns is about 1,400

people. The district served by the System is a good farming country, with small towns and villages well distributed through it but there are no industries located in the district which use power in large quantities. No information has been made available as to the number of consumers on the System or in the different municipalities served by the System.

Growth of Market and Ultimate Sources of Power Supply.

The larger centres of population in the district are now all served by the System and any rapid increase in the population served can only come about by the building up of an extensive system of rural distribution.

The power purchased by the System has, however, risen rapidly from 440 H.P. in 1919 to 1,206 H.P. in 1922, and as the point of saturation for domestic consumption has apparently not by any means been reached it is reasonable to assume that the load will continue to increase, though at a reduced rate, and might reach 2,000 H.P. within five or six years.

This figure, of course, does not include power which might be taken by industries, requiring large amounts of power, which might locate in the district.

There are no local sources of supply of power except the steam plant at the Canadian Salt Company's works at Sandwich and this is not now large enough to supply the System, nor does there appear to be any source of power for the Essex System which might be substituted for Niagara Falls. Power will undoubtedly continue to be supplied to the Essex System through the transmission lines of the Niagara System of the Hydro-Electric Power Commission of Ontario from the plants of the Commission at Niagara Falls.

people. The district served by the system is a good farming country. This
small town has villages well distributed around it but there are no industries
located in the district which use power in large quantities. No information
has been made available as to the number of consumers on the system or is the
different municipalities served by the System.

Power at Niagara and Ultimate Consumer of Power Supply.

The larger centres of population in the district are now all served by the
System and any rapid increase in the population would mean only some saving by
the building up of an extensive local distribution.

The power produced by the System has, however, risen rapidly from 4,000 H.P.
in 1912 to 1,200 H.P. in 1920, and on the point of potential for immediate
consumption the opportunity not by any means been reached it is reasonable to
assume that the load will continue to increase, though at a reduced rate, and
might reach 2,000 H.P. within five or six years.

This figure, of course, does not include power which might be taken by
industries requiring large amounts of power, which might locate in the district.

There are no local sources of supply of power except the steam plant at
the Dunville Salt Company's works at Dunville and this is not now large enough
to supply the System. Any large steam plant to be used as source of power for the
Base System would not be substituted for Niagara Falls. Power will ultimate-
ly continue to be supplied to the Base System through the transmission lines
of the Niagara System of the Hydro-Electric Power Commission of Ontario from
the plants of the Commission at Niagara Falls.

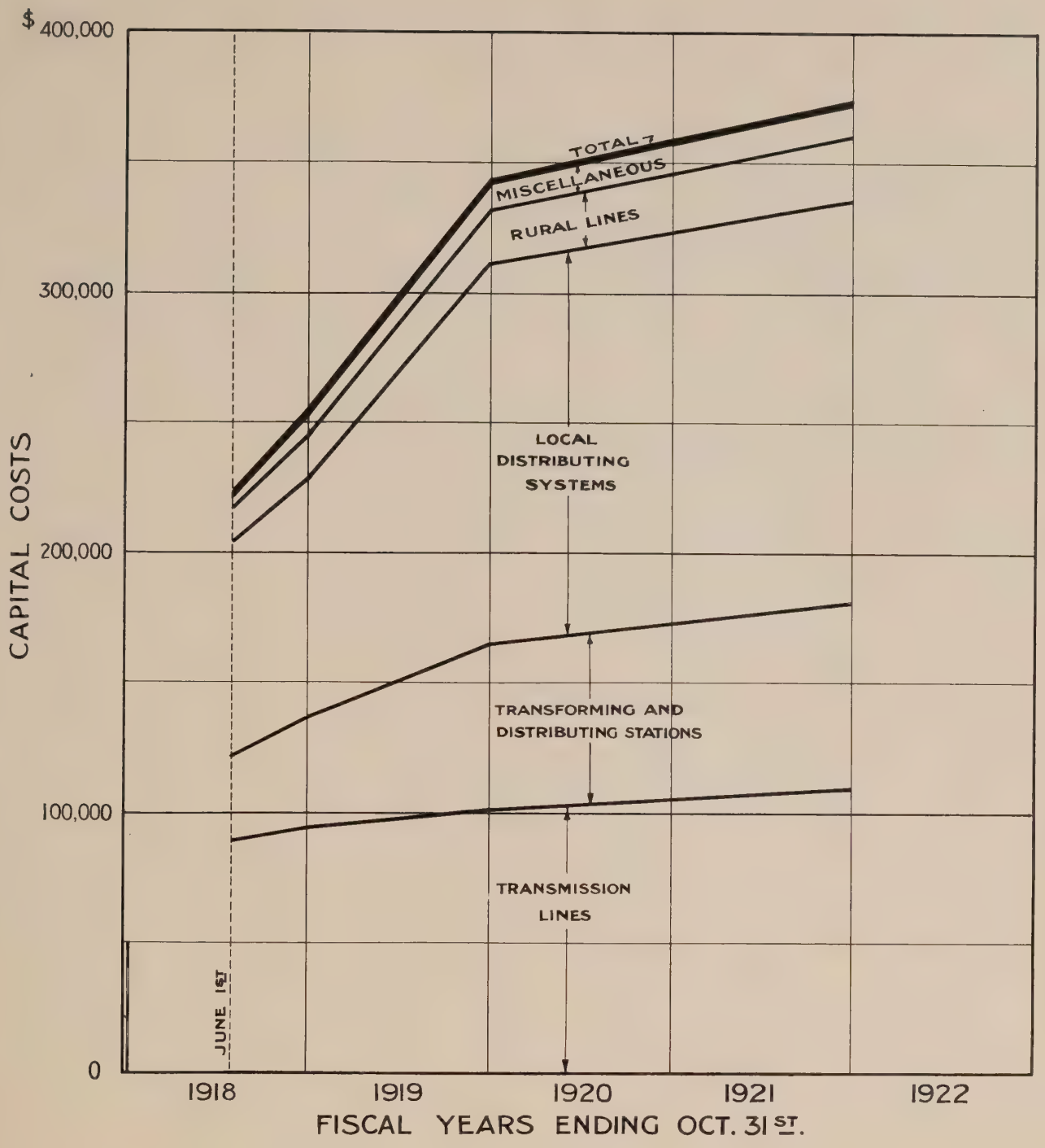
Capital Costs.

General.

In the table on page 18 the figures for the total capital costs for the years 1918 to 1921 inclusive, were obtained from a report of Messrs. Price, Waterhouse & Co. to the Hydro-Electric Inquiry Commission dated November 23rd, 1922, and entitled "Report on Investigation of Accounts of Essex System". The division of the total capital costs as at June 1st, 1918, into the different items in the table on page 18 is approximate. It has been obtained by taking the Hydro-Electric Power Commission's engineers' valuation of the assets on that date which, including materials, supplies and intangible values amounted to $226,000. This valuation is given in detail on Exhibit IV of the Price, Waterhouse report. On Exhibit I of the report the capital assets at that date are given as $221,890 made up of "transmission lines, stations, franchises and goodwill", $220,193, and three small miscellaneous items amounting to $1,697. The balance of the assets at that date, $4,110 was the value of materials and supplies and is classed in this Exhibit as "current and working assets". The value of these miscellaneous items and materials and supplies, a total of $5,807, has evidently been shown in the engineers' valuation with the transmission lines, stations, etc., to which they applied. As the distribution would be approximately according to the value of the different items, the value of each of the assets shown in the engineers' valuation has been reduced by its proportion of $5,807. The value of the old plant, $4,359 thus obtained has been included with the miscellaneous items mentioned above and together

these make up $6,056, the value given for miscellaneous capital assets.

For the year 1921, Exhibit I of the report gives the value of transmission lines, stations, franchises, goodwill, etc., as $367,156, and miscellaneous items $5,620, making a total of $372,776. In Exhibit XIII of the report of Messrs. Price, Waterhouse & Co. to the Hydro-Electric Inquiry Commission, entitled "Memorandum re Analysis of Capital Assets of the Hydro-Electric Power Commission and of Controlled and Operating Companies and Systems", dated August 2nd, 1922, Hydro-Electric Inquiry Commission file 93-a-2, the distribution of the amount of $367,156 over the different items is given. The "Amount in Excess of Book Value of Assets at Date of Acquisition" shown as $6,866, has been distributed over the different items in the proportion they originally bore to each other. Therefore the division for this year also must be considered as approximate only. The value of Leamington General Office, $6,972, has been included under "miscellaneous". There is no information available by which the distribution of the total capital assets for the intervening years can be made and they have in consequence been left blank in the table and on the sheet of curves included as page 17 of this report and which is a graphic representation of the figures in the table. The known points have simply been joined by dotted lines to indicate the trend of the changes for the intervening years.



HYDRO-ELECTRIC INQUIRY COMMISSION
W. D. GREGORY, CHAIRMAN
ECONOMICS OF H. E. P. C. DISTRIBUTION SYSTEMS
ESSEX SYSTEM

PROGRESSIVE CAPITAL COSTS

Toronto, June 11th., 1923. Made by S.R.W., Checked by L.L.W.
WALTER J. FRANCIS & COMPANY
CONSULTING ENGINEERS

Table of Progressive Capital Costs

Capital Assets including Intangible Values	As at June 1st, 1918	As at Year Ending October 31st, 1918	1919	1920	1921	1922
Transmission Lines	$89,952				$108,602	
Transforming and Distributing Stations	31,934				72,527	
Local Distributing Systems	82,476				154,626	
Rural Lines	11,472				24,241	
Miscellaneous	6,056				12,780	
Totals	$221,890	$253,172	$343,247	$359,397	$372,776	-

Of the total increase of $150,886 in capital costs, $121,357 was expended previous to October 31st, 1919 in the first seventeen months after the System was purchased by the Commission, $62,216 being expended for 25-cycle equipment to replace the 60-cycle equipment in use on the System when it was purchased. The remainder covers the cost of the new transmission line built to connect the System with the Essex transformer station of the Niagara System, the cost of converting the old steam plant into an office and stores building and various improvements to existing transmission lines and distribution stations and systems. Since October 31st, 1919, the capital expenditure has been small and represents improvements and small extensions made principally to the distribution systems which stood at $154,626 at October 31st, 1921.

Power Data.

The following table and the sheet of curves included as page 20 of this report show the characteristics of the Essex System in terms of horse-power.

Table of Progressive Capital Costs

Capital Assets Including Intangible Items	As at June 1st, 1918	As at Year Ending October 31st, 1919	1920	1921	1922
Transmission Lines	$89,982				$108,602
Transformers and Distributing Stations	31,784				72,127
Local Distributing Systems	82,476				184,638
Rural Lines	11,472				26,241
Miscellaneous	6,062				12,170
Total	$221,776	$242,127	$262,327	$282,527	$402,778

Of the total increase of $180,802 in capital assets, $121,627 was expended previous to October 31st, 1919 in the first seventeen months after the System was purchased by the Commission. The latter expended the 22-cycle equipment to replace the 25-cycle equipment in use on the System when it was purchased. The remainder covers the cost of the new transmission line built to connect the System with the Niagara transformer station of the Ontario System, the cost of converting the old steam plant into an office and storer building and various improvements in existing transmission lines and distribution stations and systems. Since October 31st, 1919, the capital expenditure has been small and represents improvements and small extensions made principally to the distribution system which amount to $124,212 at October 31st, 1922.

Power Data.

The following table and the chart of centre indicate on page 30 of this report show the characteristics of the Power Supply in terms of Kilowatts.

Table of Horse-power Purchased, etc.

	Fiscal Year Ending October 31st,			
	1919	1920	1921	1922
H.P. Purchased	440	972	1090	1206
H.P. Average of Monthly Peaks	440	972	1090	1206
H.P. Maximum Yearly Peak	831	1126	1213	1307

The figures given in the table were obtained from the engineers of the Hydro-Electric Power Commission. The figures for horse-power billed are not available and it is stated by the engineers of the Hydro-Electric Power Commission that no kilowatt-hour data for the System are available. It is in consequence not possible to obtain the "average horse-power consumed by the System".

The figures for horse-power purchased represent the power taken by the System from the Essex transformer station of the Niagara System. Although the System has been in operation since June 1st, 1918, no figures for power in 1918 are given. Power used in that period was purchased from the Canadian Salt Company on a kilowatt-hour basis and no record of peaks, etc., appears to have been kept.

Average Monthly Peaks.

The figures of average monthly peaks were obtained by taking the sum of the monthly peaks as shown in the records of the Commission and dividing by twelve to get an average monthly peak.

Table 4: Shelterbrook Pondscape, etc.

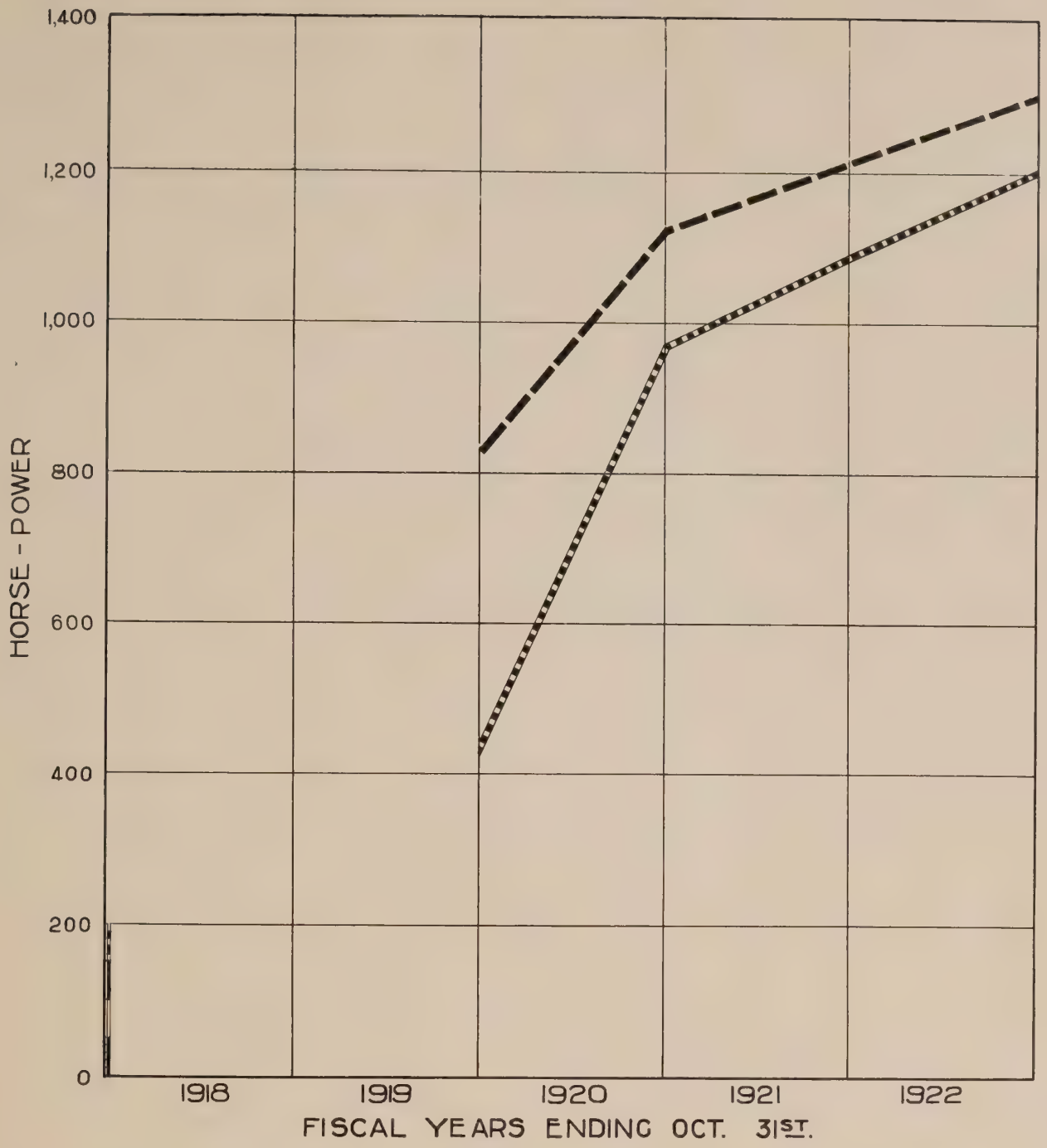
	Yearly Peak Inflow Volume, Ft³.			
	1919	1920	1921	1922
S.L. Pondscape	450	375	3400	3202
S.F. Stream of Shelter Pond	450	375	3000	3200
N.P. Maximum Yearly Peak	321	1125	1112	1327

The figures given in the table were obtained from the pondscape of the Shelter-Shelterbrook Power Commission. The figures for Lake-Green Hills are not available and it is stated by the engineers of the Shelter-Shelterbrook Power Commission that no difficulty-free data for the Green are available. It is unfortunate that pondscape data for the Green Lake Power Commission supplied by the Bystem".

The figures for Lake-Green ponds supplied the same data by the System from the Steam Generation section of the Shelter-System. Although the System has been in operation since June last 1919, no figures for summer inflow are given. These data do not particularly prohibit from the Shelter-Hill Commission a different basis and on account of weeks, etc., Spring is very wet and dry.

Inflow Monthly Peaks.

The figures of average monthly peaks were obtained by taking the sum of the monthly peaks as shown in the records of the Commission and dividing by twelve to get an average monthly peak.



HORSE-POWER PURCHASED AVERAGE MONTHLY PEAKS
" " " MAXIMUM YEARLY PEAK

HYDRO-ELECTRIC INQUIRY COMMISSION
W. D. GREGORY, CHAIRMAN
ECONOMICS OF H. E. P. C. DISTRIBUTION SYSTEMS
ESSEX SYSTEM

HORSE-POWER DATA

Toronto, June 11th., 1923. Made by, Checked by.
WALTER J. FRANCIS & COMPANY
CONSULTING ENGINEERS

Maximum Yearly Peak.

The figures for maximum yearly peak represent the greatest quantity of power taken at any time throughout the year.

The curves on page 20 have been plotted directly from the figures in the table and show the table in graphic form.

Capital Costs per Horse-power Purchased.

The following table shows the fractional capital costs per horse-power purchased for the year 1921 and the total capital cost per horse-power for the other years. These figures are based on those in the table of progressive capital costs given on page 18 and in the table of "Horse-power Purchased" given on page 19. As previously explained it has been impossible to allocate the capital costs for the years 1919 and 1920 under different headings, and in consequence, only the total cost per horse-power purchased can be shown for these years.

Table of Capital Costs per Horse-power Purchased

	Fiscal Years Ending October 31st, 1919	1920	1921
Transmission Lines			$ 100.00
Transforming and Distributing Stations			66.00
Local Distributing Systems			142.00
Rural Lines			22.00
Miscellaneous			12.00
Totals	$ 761.00	$ 370.00	$ 342.00

There is no heading for generating plants in the table of capital costs per horse-power purchased as there are none on the Essex System, all power being purchased. The high capital costs per horse-power are due to the comparatively great length of transmission lines for a system using so little power and to the fact that all the local distributing systems are included in the capital costs.

There is no separate main receiving station for the System, each distributing station of the Essex System takes its power as required from the lines fed by the Essex transformer station of the Niagara System. This being the case, if it should be desired to obtain the cost per horse-power installed it would be necessary to consider the horse-power installed as the sum of the capacities of the individual stations. This was about 1,100 horse-power in 1921.

Total Annual Revenues.

The figures for the total annual revenues of the Essex System have been taken from Exhibit II of the report of Price, Waterhouse & Co., and are revenues from the sale of power only. The revenue has not been distributed between the Power and Municipal Departments as they essentially operate together. The Essex System has in this respect been considered as if it were operating as a private company.

Period	Total Revenues per Annum
June 1st, 1918 to October 1st, 1918	$ 17,253
Year Ending October 31st, 1919	53,896
Year Ending October 31st, 1920	85,762
Year Ending October 31st, 1921	111,419

The total annual revenues have been plotted as a curve on page 35 and their relation is there shown to the total annual cost and the annual and accummlated profits or deficits.

Total Annual Costs of Power.

The total annual operating costs of the Essex System have not been separated into the cost of the power system and the cost of the local distributing systems. Since the whole system is owned and operated entirely by the Hydro-Electric Power Commission it has been considered as an entity.

The table on page 25 shows the cost of power subdivided under various headings for the years 1918 to 1921 inclusive and the sheet of curves included as page 26 shows these figures plotted in graphic form. The figures have been taken from Exhibit II and Exhibit II-b of the Price, Waterhouse & Co. report.

The figures for the total annual costs of power are also shown graphically by one of the curves on page 35 in their relation to total annual revenues and annual and accummlated profits or deficits. The items comprising the total annual costs have been grouped under the following headings:

Power Purchased.

A separate heading for power purchased has been included for the reason that no power is generated on this System and the charge for the purchase of power is much the largest single item in the total annual cost of power. The amount shown for each year is the total charge to the Essex System for power purchased

The total annual revenue bears less relation to a state's ability to pay than does relation to the total annual revenue and the annual and accumulated profits or deficits.

Annual Annual Data of Other.

The total annual operating money of the Texas System has not been adequate to take care of the needs, during the past of the local distribution systems. Thus the state system is annual and operated entirely by the Electric Power Investigation is has been neglected on an entirely.

The basis on plan of [illegible] power monitoring [illegible] taxation for the years 1924 to 1931 inclusive and the above or private financing is plus 24 month these figures initial is available first. The figures have been taken from Exhibit II and Exhibit 1-4 of the plan, Mr. J. Dove report.

The figures for the total annual bonds of power are also given specifically by one of the power is plus if is first available to local annual revenues and annual and accumulated profits or deficits. The plans considering the total annual costs have been prepared under the following headings.

Power Distribution.

A separate budget for power purchased has been included in the means that is power is generated or this system and the charge for the purchase of power is much the largest single item in the total annual cost of power. The amount shown for each year is the total charge to the Dove System for power purchased

from the Niagara System of the Hydro-Electric Power Commission, and includes its proportion of administrative expense.

Operating Costs.

Operating costs include the wages of transforming and distributing station operators, linemen, attendants and so forth, supplies and miscellaneous items usually grouped under this heading.

Maintenance.

Under this heading have been grouped all the items shown in Exhibit II-b of the Price, Waterhouse & Co. report including items for transmission lines, stations and local systems. Both labour and materials which can properly be charged to maintenance are included.

Overhead and General Expense.

Under the heading of overhead and general expense are grouped such items as salaries of local officers and clerks, office supplies, stores operation, taxes, insurance, uncollectable accounts, promotion of business and head office administration, all in accordance with Exhibit II-b of the Price, Waterhouse & Co. report. The totals for these items have been reduced by the amount of "miscellaneous income" shown in Exhibit II of the report, as it was considered that this amount was properly an overhead credit and should not be included with power revenues.

Interest, Renewals, Sinking Fund.

The figures for these various headings have been taken directly from the report of Messrs. Price, Waterhouse & Co.

Table of Total Annual Costs of Power

	June 1st, - Oct. 31st, 1918	Fiscal Year Ending Oct. 31st, 1919	1920	1921
Power Purchased	$11,528	$22,239	$29,895	$ 34,875
Operation	1,097	3,603	4,865	4,395
Maintenance	2,200	7,268	15,929	13,954
Overhead and General Expense	5,421	10,696	9,116	12,543
Interest	4,199	15,231	18,262	19,100
Renewals	3,716	9,884	12,759	13,732
Sinking Fund	1,779	4,270	4,270	4,270
Totals	$29,941	$73,191	$95,097	$102,869

It is to be noted that no reserve for contingencies has been made in any year.

The revenues fell short of covering the costs by $12,687 in the five months ending October 31st, 1918; by $19,295 in the year 1919; and by $9,335 in 1920, giving a total accumulated deficit of $41,317 at that date. In 1921 there was a surplus of $8,551, and it is stated that the surplus for 1922 will amount to about $24,000, thus reducing the accumulated deficit to about $8,800 at October 31st, 1922.

The Essex System, as previously stated, is owned entirely by the Hydro-Electric Power Commission and there are no contracts with municipalities by which any loss sustained is made up in the cost of power to them in the following year. The operating deficit has apparently been partially met by using the funds set aside as "reserve for renewals" and "provision for sinking fund" so

Salaries, Commission, Light, Gas:

The figures for these matters including taxes have been taken directly from the report of Messrs. Price, Waterhouse & Co.

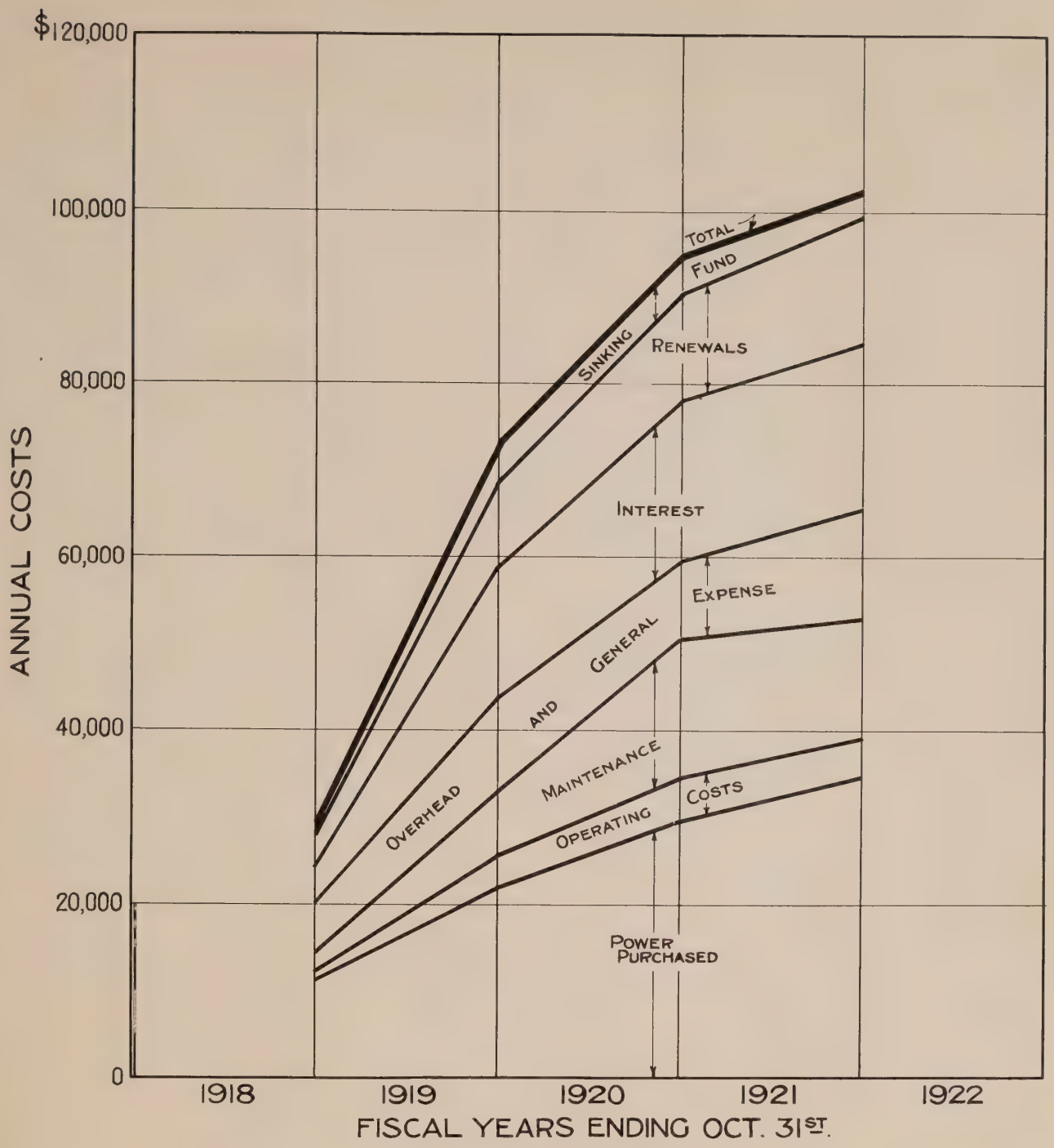
Table of Total Annual Costs of Power

Year ended Dec. - Two Mths. Ended Dec. Fiscal Year Ending Feb. Eight.	1918	1919	1920	1921
Power Purchased	$11,[illegible]	$22,[illegible]	$29,[illegible]	$ 24,[illegible]
Operation	1,[illegible]	3,[illegible]	4,[illegible]	4,[illegible]
Maintenance	2,[illegible]	7,[illegible]	16,[illegible]	15,[illegible]
Depreciation and General Expense	1,[illegible]	10,[illegible]	9,[illegible]	12,[illegible]
Interest	4,[illegible]	13,[illegible]	18,[illegible]	19,[illegible]
Insurance	[illegible]	3,[illegible]	12,[illegible]	13,[illegible]
Taxing Fund	[illegible]	4,[illegible]	4,[illegible]	4,[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]

It is to be noted that no reserve for depreciation has been made in any year.

The revenue will short of covering the costs by $11,[illegible] in the five months ending December 31st, 1918; by $21,[illegible] in the year 1919; and by $[illegible] in 1920, giving a total accumulated deficit of $[illegible] at that date. In 1921 there was a surplus of $[illegible], but it is noted that the surplus for 1921 will amount to about $14,[illegible], thus reducing the accumulated deficit to about $[illegible] at December 31st, 1921.

The Power System, as previously stated, is wholly utilized by the Dominion-Scotia Power Commission, but there are no contracts with municipalities by which any loss sustained is made up in the most of power is lost in the distributing plant. The operating deficit has apparently been partially met by making the rates as "reserve for depreciation" and "depreciation the sinking fund" or



HYDRO-ELECTRIC INQUIRY COMMISSION
W. D. GREGORY, CHAIRMAN
ECONOMICS OF H. E. P. C. DISTRIBUTION SYSTEMS
ESSEX SYSTEM
TOTAL ANNUAL COSTS
Toronto, June 11th., 1923. Made by GEO., Checked by L.A.H.
WALTER J. FRANCIS & COMPANY
CONSULTING ENGINEERS

that the amounts as shown to the credit of these accounts are in part book-keeping credits only and the total amount shown will not actually exist until the accumulated deficit will have been wiped out.

Percentage Costs of Power.

The following table and the sheet of curves included as page 28 show the annual cost figures as percentages of the total cost of power per annum and these are included as a method of comparison with other systems or similar properties:

COPY

Table of Annual Costs Subdivided by Percentages

	June 1st, to Oct. 31st, 1918	Fiscal Year Ending October 31st, 1919	1920	1921
Power Purchased	38.5	30.4	31.5	33.9
Operation	3.7	4.9	5.1	4.3
Maintenance	7.3	9.9	16.7	13.6
Overhead and General Expense	18.1	14.6	9.6	12.2
Interest	14.0	20.9	19.2	18.6
Renewals	12.5	13.5	13.4	13.3
Sinking Fund	5.9	5.8	4.5	4.1
Totals	100.0%	100.0%	100.0%	100.0%

Analysis of Reserve Accounts.

Renewals Account.

Shortly after the acquisition of the System on June 1st, 1918, an appraisal was made by the engineers of the Commission for the purpose of determining the

that the amounts at risk or the credit of these accounts are in part budgeting credits only and the total amount thereof will not actually exist until the accumulated deficit will have been wiped out.

Investment Trends at Issue.

The following table and the chart of curves included on page 28 show the annual net figures as percentages of the total cost of power per annum and these are included as a method of comparison with other systems on similar properties:

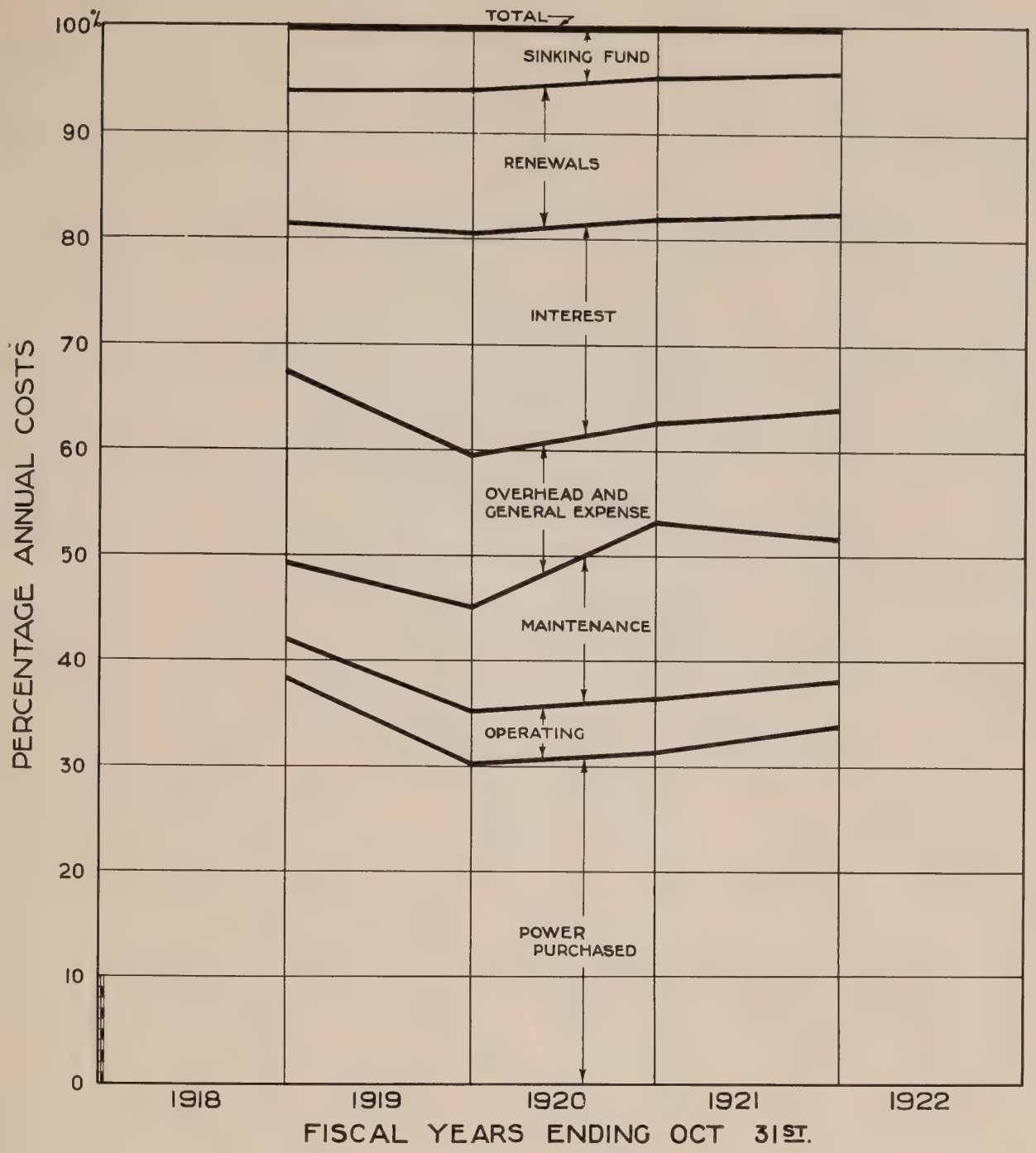
Table of Annual Costs Expressed in Percentages

	June 1st, to Oct. 31st, 1919	Fiscal Year Ending October 31st, 1920	1921	1922
Power Purchased	36.8	30.4	31.8	33.9
Operation	8.7	4.9	8.1	4.3
Maintenance	7.3	9.9	16.7	13.6
Overhead and General Expense	18.1	14.6	9.6	12.2
Interest	14.0	30.9	19.3	18.6
Reserve	12.8	18.5	12.4	12.5
Sinking Fund	2.9	5.8	4.8	4.1
Totals	100.0%	100.0%	100.0%	100.0%

Analysis of Income Accounts.

Income Account.

Shortly after the inauguration of the System on June 1st, 1919, an arrangement was made by the engineers of the Commission for the purpose of determining the



HYDRO-ELECTRIC INQUIRY COMMISSION
W. D. GREGORY, CHAIRMAN

ECONOMICS OF H. E. P. C. DISTRIBUTION SYSTEMS

ESSEX SYSTEM

ANNUAL COSTS SUBDIVIDED BY PERCENTAGES

Toronto, June 11th, 1923. Made by [illegible], Checked by [illegible]

WALTER J. FRANCIS & COMPANY
CONSULTING ENGINEERS

amount of depreciable capital and the percentage to be used in setting aside reserves for renewals. This appraisal shows that the depreciable assets amounted to about $225,567. The division of this amount into different classes of properties is shown in the table below which has been taken from the report of Messrs. Price, Waterhouse & Co. on the Essex System. The percentages, when figuring on a sinking fund basis, used in determining the amount to be set aside yearly for renewals of the different classes of property, and the amount to be so set aside annually are also shown in the table.

The percentage rates applied on the transmission lines and distributing stations are the same as those applied to the similar properties on the Niagara System and take into account the estimated life and the residual value, etc. of each article making up the properties.

The rate used for distributing systems is the one recommended by the Commission for use by municipalities operating similar systems and is determined in a similar manner to that for transmission lines and distributing stations.

Table of Depreciable Capital and Reserve for Renewals, 1918

Classification of Properties	Capital Investment	Percentages used (Sinking Fund Basis)	Annual Provision Required
Wood Pole Lines	$104,353	4.20	$ 4,383
Distributing Stations	33,493	3.35	1,122
Distributing Systems	87,722	4.00	3,509
Total (Exclusive of Old Plant)	$225,568		$ 9,014

This works out as an average percentage of 3.996 and the renewal rate was established on a 4 per cent. basis on the depreciable capital which on this System is practically the total capital assets.

manner of depreciable capital and the percentages to be used in setting aside reserves for renewals. This approach shows that the depreciable assets amounts to about $[illegible],[illegible]. The difference of this amount under distribution assets at present is given in the table below which has been taken from the report of Messrs. Dyer, Commissioner S Co. on the same subject. The percentages when figured on a sinking fund basis, used to determine the amount to be set aside yearly for renewals of the different classes of property, and the amount to be set aside annually are also shown in the table.

The percentages rates applied to the transmission lines and distributing assets are the same as those applied to the similar properties on the Niagara System and Lake Erie [illegible] lines and the residual assets, estimated of such article making up the properties.

The rate used for electrical system is the one recommended by the Commission for use by municipalities operating similar systems and is derived in a similar manner to that for transmission lines and distributing assets.

Table of Depreciable Capital and Reserve for Renewals, 1911

Classification of Properties	Capital Investment	Percentage used (Sinking Fund Basis)	Annual Provision Required
Wood Pole Lines	$104,322	4.30	$ 4,[illegible]
Distributing Station	[illegible]	[illegible]	[illegible]
Distributing System	[illegible]	[illegible]	[illegible]
Total (Exclusive of Gas Plant)	[illegible]		$ [illegible]

This rate can be an average percentage of 3.[illegible] and the annual rate was established on a 4 per cent. basis on the depreciable capital which in this system is practically the total capital assets.

The annual provision for reserves for renewals on a 4 per cent. sinking fund basis with interest at 4 per cent. would accumulate a reserve equal to the depreciable capital on which the reserve was calculated in a period of about eighteen years, provided no charges were made against the reserve.

It is stated that it is the practice of the Hydro-Electric Power Commission to maintain the System in a condition for economical operation which is stated to be about 75 per cent. as good as the original new condition and that the expense of doing so is charged to maintenance. In consequence of this practice it was considered in this report that the reserve for renewals should be considered in its relation to the balance, namely to 25 per cent. of the depreciable capital.

At October 31st, 1921, the depreciable capital was about $372,000, and 25 per cent. of this amount is $93,000. So long as the practice of charging to maintenance all expenditures necessary to keep the plant up to 75 per cent. of its new condition is continued, this amount of $93,000 would be all that the renewals reserve would have to cover. The renewals reserves at October 31st, 1921, amounted to about $41,685, which appears to be ample; and, if the present rate of making annual additions to the reserves be maintained with interest compounded in the usual way, the renewals reserves soon will become unnecessarily large.

It is stated that lately the various heads of the departments of the Hydro-Electric Power Commission have been studying the question of depreciation rates and the proper allowance for useful length of life for each kind of equipment and that they have come to the conclusion that the rates formerly allowed have been too high; in other words, the actual deterioration of the various parts of the System has not been so great as was expected. It is stated that they have prepared figures to show that their former practice was too conservative in

allowing for estimated useful life, and they have, therefore, suggested that the renewal allowance on a sinking fund basis be considerably reduced in the annual charges. If this suggestion be adopted it would have the effect of building up the reserve fund in future at a slower rate, and of correspondingly reducing the annual costs and consequently reducing the total annual cost of power.

There are a number of points which should receive careful attention in dealing with the question of these reserves for renewals. One is the proportion of the yearly expense for renewals which is to be charged to maintenance. Another is the proposed change in the estimated length of useful life of various portions of the equipment, which will materially affect the annual allowance. A third is the question of the proper rate of interest to be chosen in estimating the earning power for the reserve fund. A strict theory of the earning power of the renewal fund should take into account not only the method of investing the fund, for example, whether it be used in making extensions and betterments in the System as has actually been done, or invested in separate securities and treated like a trust fund, but also the rate of annual interest which should be adjusted each year in accordance with the actual value of money. The legal limitations of the allowable investment of the fund should also be kept in mind in this connection.

<u>Sinking Fund.</u>

As mentioned previously in this report the Essex System is owned entirely by the Hydro-Electric Power Commission and there are no contracts with

municipalities under which power is supplied at cost. Apparently under these circumstances the Power Commission Act does not require the establishment of a sinking fund for the retirement of the bonds of the Commission guaranteed by the Province of Ontario which were issued in payment for the System, nor for the retirement of the cash advances made by the Commission and the Province to the System since it was acquired.

In Mr. Clarkson's report for the year ending October 31st, 1921, it is stated "With no municipalities under contract with the Commission to pay cost for power delivered by the Essex System there would also appear to be no provisions in the Power Commission Act requiring the establishment of sinking funds for repayment of the advances by the Province and the Commission to the Essex System."

However, notwithstanding this statement, in each year since the acquirement of the System by the Commission there has been set aside an amount for sinking fund which, if the practice be continued, will be sufficient to meet the bonds given in purchase of the System at their maturity.

At October 31st, 1921, the sinking fund payments with interest amounted to about $15,329, but with the total deficit from operations to that date amounting to $32,766, the amount of sinking fund had not been collected by the Commission but was included in the deficit. The annual report for the year ending October 31st, 1922, is not yet available, but it is stated that at that date the deficit had been reduced to about $8,800. It is probable that the deficit will be entirely wiped out in the year ending October 31st, 1923, and when this result has been attained the amount to the credit of sinking fund account will be

available for investment in securities of the Province if it should be decided to utilize it in that way.

No provision, however, is apparently being made for sinking fund payments on the cash advances to the System by the Commission and the Province amounting to about $141,149 at October 31st, 1921. It would seem advisable that some provision should be made for the retirement of these cash advances by the establishment of a sinking fund for this purpose.

Reserve for Contingencies.

No reserve for contingencies had been established at October 31st, 1921, and it would seem to be advisable to set aside such a reserve now or as soon as the System is able to meet all the other operating charges. Power charges should if necessary be slightly increased to allow for the establishment of the reserve for contingencies and when this reserve has been built up by the annual allowances to, say $8,000 or $10,000, and the average annual charges against this reserve have been determined by some years of experience, the charge for this reserve in the cost of power might be again reduced.

Discussion of Deficits and Surpluses.

The following table shows the total annual costs, the total annual revenues, and the annual resultant profit or loss, for the System considered as a whole, the power department and the retail department being considered as one.

The curves on page 35 are plotted directly from the figures in the table

available for investment in consideration of the Province. It is already in demand to utilize it in this way.

In practice, however, it appears very that some for library and museum purposes on the same authority as the grants by the Government and the Provincial Government of about $25,000 or thereabouts. It would seem unfortunate that some provision should be made for the maintenance or issue such authority by the establishment of a statute that has this purpose.

Reserve for Contingencies.

No reserve for contingencies has been established at October 31st. Until and it would seem to be advisable to set aside such a reserve now or as soon as the system is able to meet all the other operating obligations. Under circumstances it necessary be allowed for the establishment of the reserve for contingencies and when this reserve has been built up to the annual allowance of, say $4,000 or $5,000, and the average annual charges against this reserve have been determined by some period of experience, the charge for this reserve in the cost of power might be again reduced.

Allowance of Interest and Depreciation

The following table shows the total annual costs, the total annual revenue, and the annual revenue surplus or loss. The the charge consisting of a charge, the power department and the public department being considered as one.

The figures in Item 20 are taken directly from the figures in the table

and indicate graphically the result of operations.

The total annual revenue is shown as one curve, the total annual cost as another and the two curves nearer the datum line show the annual resultant profit or deficit, and the accumulated resultant deficit.

It is to be noted that since 1919 there has been improvement in the operating resultant, and that in 1921 there was a profit of about $8,551. The annual report for the year ending October 31st, 1922, is not yet available, but it is stated that the profit from operations for that year amounted to about $24,000. This would bring the accumulated resultant to a deficit of about $8,800, and the trend of the figures and curves indicates that the deficit will probably be wiped out in the year ending October 31st, 1923 and that a small accumulated resultant profit will be shown.

It is probable that the capital expenditures will not be greatly increased for some years, and that the only items tending to increase the cost of operations will be firstly, provision for sinking fund reserves to retire the cash advances made to the System and secondly, the charges necessary to build up a reserve for contingencies, neither of which will be very large. Offsetting these increases there might be a decrease in the reserve for renewals account.

Table of Costs, Revenues, Profits and Deficits

	Fiscal Year Ending October 31st,			
	1918 5 Mos.	1919	1920	1921
Total Annual Cost	$29,941	$73,191	$95,097	$102,869
Total Annual Revenues	17,253	53,896	85,762	111,419
Annual Profits				8,551
or Annual Deficit	12,687	19,295	9,335	
Accumulated Deficit	12,687	31,982	41,317	32,766

and delicate geographically the equals of Consolidated.

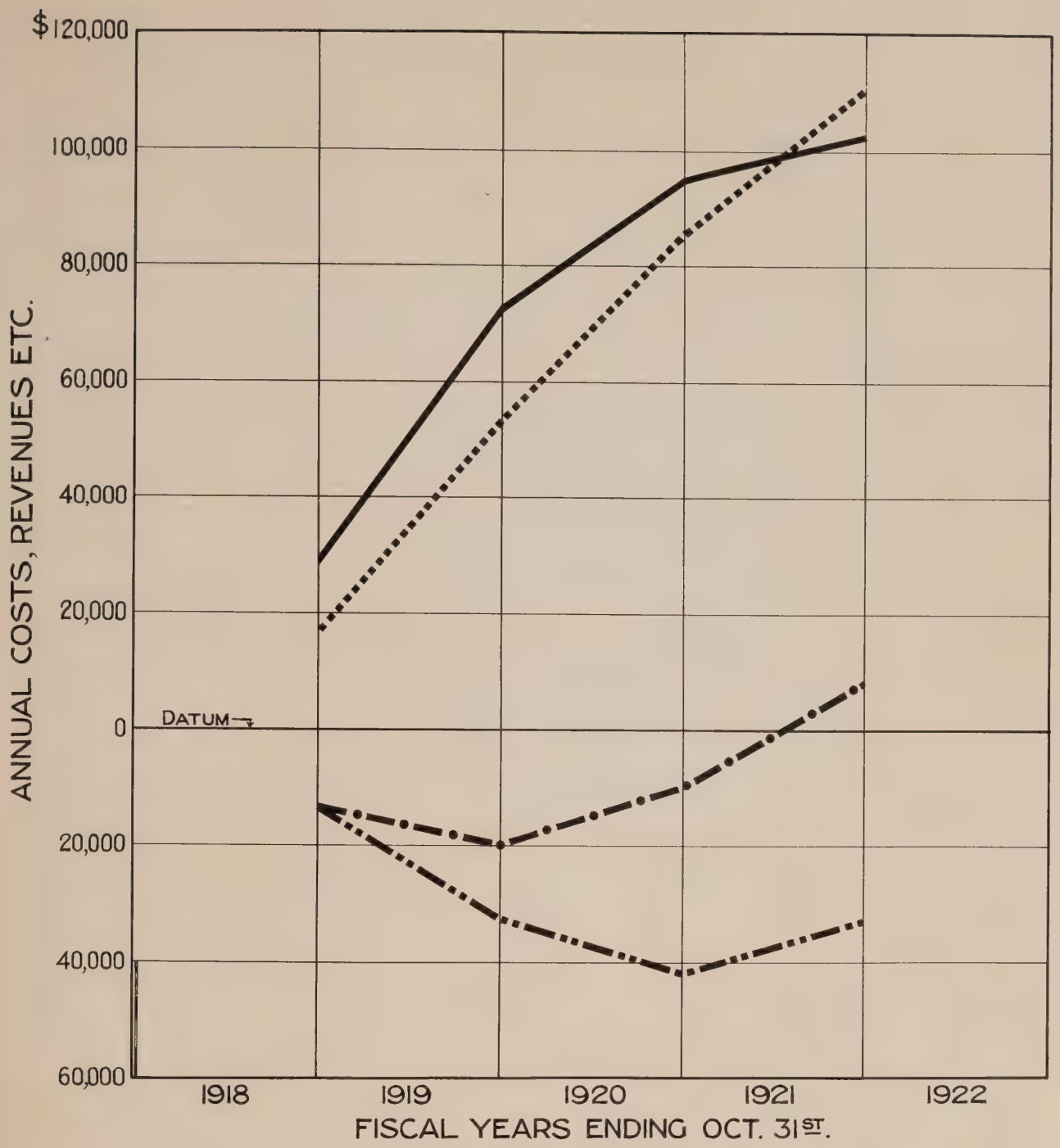
The local manual exchange is about as one sorry. Its total annual revenue is [illegible] and the net earnings equal the dividend requirements of preferred or debtor, and the accumulated revenues deficit.

It is on the revised Bond Ratio Data which Bartlett Lightbourn is the operating receivers, and that is [illegible] and a profit of about $[illegible]. The annual report for the year ending December 31st, 1940, is not yet available, but it is stated that the profit from operations for last year amounts to about $[illegible]. This small income for accumulated revenues is a deficit of about $[illegible], and the amount of the interest and sinking fund requirements which [illegible] that a small accumulated revenues deficit will be shown.

It is probable that the public regulations will not be generally increased for some years, and that the only hope lies in increasing the base of rates. [illegible] will be finally, providing the electric fuel shortage is lessened so that the [illegible] expenses made to the Brooklyn-Edison company, the income necessary to build up a reserve for contingencies, utilize at cheap will be very large. Effecting these improvements there might be a business in the reserve for immediate [illegible].

Table of Costs, Revenues, Profits and Deficits

	Fiscal Year Ending October 31st,			
	1918	1919	1920	1921
	F.Yr.			
Total Annual Cost	[illegible]	[illegible]	[illegible]	[illegible]
Total Annual Revenues	[illegible]	[illegible]	[illegible]	[illegible]
Annual Profits				[illegible]
or Annual Deficit	[illegible]	[illegible]	[illegible]	
Accumulated Deficit	[illegible]	[illegible]	[illegible]	[illegible]



Total Annual Cost
" " Revenue
Annual Profit or Deficit
Accumulated Deficit

Hydro-Electric Inquiry Commission
W. D. Gregory, Chairman
Economics of H. E. P. C. Distribution Systems
Essex System
ANNUAL COSTS
REVENUES AND DEFICITS
Toronto, June 11th., 1923. Made by G.A.B., Checked by L.d.H.
Walter J. Francis & Company
Consulting Engineers

Revenues and Costs per Horse-power per Annum.

In order to reduce the total costs of operation to a basis where they could be compared with other systems, a set of tables and diagrams have been prepared to show the costs per horse-power per annum for different bases of horse-power. The figures have also been analyzed to show the total annual costs subdivided into fractional amounts chargeable against each kind of expense, based on the horse-power purchased per annum.

The table on page 37 and the sheet of curves on page 38 show the total costs per horse-power per annum on different bases. The figures in the table were obtained by dividing the amounts given for the total costs of power in the table on page 34 by the amount of the total horse-power, on different bases as given in the table on page 19. As the horse-power purchased and the average of monthly peaks in horse-power are the same, the costs per horse-power on these two bases are identical and are shown by the same curve.

As previously mentioned the figures for horse-power billed and for horse-power consumed on the System are not available consequently the table contains horse-power figures under three headings only, and only two curves are shown as the horse-power figures for two of these headings are identical.

A table on page 37 shows the subdivided costs per annum per horse-power purchased under the various headings of power purchased, operating, maintenance, overhead and general expense, interest, renewals and sinking fund. These figures were obtained by dividing the figures for the total annual costs of power, as subdivided under various headings in the table on page 25, by the figure for the horse-power purchased in each year given in the table on page 19.

Expenses and Costs per Horse-power per Annum.

In order to reduce the total costs of operation to a basis upon which they could be compared with other vehicles, a set of tables and diagrams have been prepared to show the costs per horse-power per annum for different years of horse-power. The figures have been analysed to show the total annual costs substituted into theoretical economic depreciation against each year of expenses, based on the horse-power purchased per annum.

The table on page 27 and its sub-sheets at appendix on page 31 show the total costs per horse-power per annum on different bases. The figures in the table were obtained by dividing the total annual costs by the total units of power in the table on page 24 by the number of the total horse-power, on different bases as given in the table on page 18. In the horse-power purchased and the average of monthly peaks in horse-power are the same, the costs per horse-power on these two bases are identical and are shown by the same curve.

As previously mentioned the figures for horse-power billed and for horse-power measured on the lighter are not available consequently the total available horse-power figures under these headings only and only for months are shown as the horse-power figures for the al their headings are identical.

A table on page 27 shows the modified costs per annum per horse-power produced under the various headings of power production, generating, maintenance, overhead and general expenses, interest, renewals and sinking funds. These figures were obtained by dividing the figures for the total annual costs of power, as published under various headings, in the table on page 24, by the figure for the horse-power purchased in each year given in the table on page 18.

The curves on page 39 are plotted directly from the figures in the table.

If a further analysis be desired a similar table and sheet of curves might be prepared to show the subdivided costs per horse-power on the basis of the maximum yearly peak horse-power, but this has not been done for this report. The tables are as follows:

Table of Total Costs per Horse-power per Annum

	Fiscal Years Ending October 31st,		
	1919	1920	1921
H.P. Purchased	$166.26	$ 97.81	$ 94.38
H.P. Average 12 Monthly Peaks	166.26	97.81	94.38
H.P. Maximum Yearly Peak	88.20	84.40	78.80

Table of Subdivided Costs per Annum per Horse-power Purchased

	Fiscal Years Ending October 31st,		
	1919	1920	1921
Power Purchased	$ 50.50	$ 30.75	$ 32.00
Operation	6.18	5.01	4.03
Maintenance	16.54	16.39	12.80
Overhead and General Expense	24.30	9.38	11.50
Interest	34.60	18.78	17.53
Renewals	22.44	13.11	12.60
Sinking Fund	9.70	4.39	3.92
Total Costs per H.P.	$166.26	$ 97.81	$ 94.38
Total Revenues per H.P.	122.50	88.25	102.20

The total revenues per annum per horse-power purchased are shown in the table above and on the sheet of curves on page 38.

The curves on page 38 are plotted directly from the figures in the table.

If a further analysis is desired a similar table can be made or curves also be prepared to show the monthly, weekly or horse-power or kw hours of the various parts of the plant.

The tables are as follows:

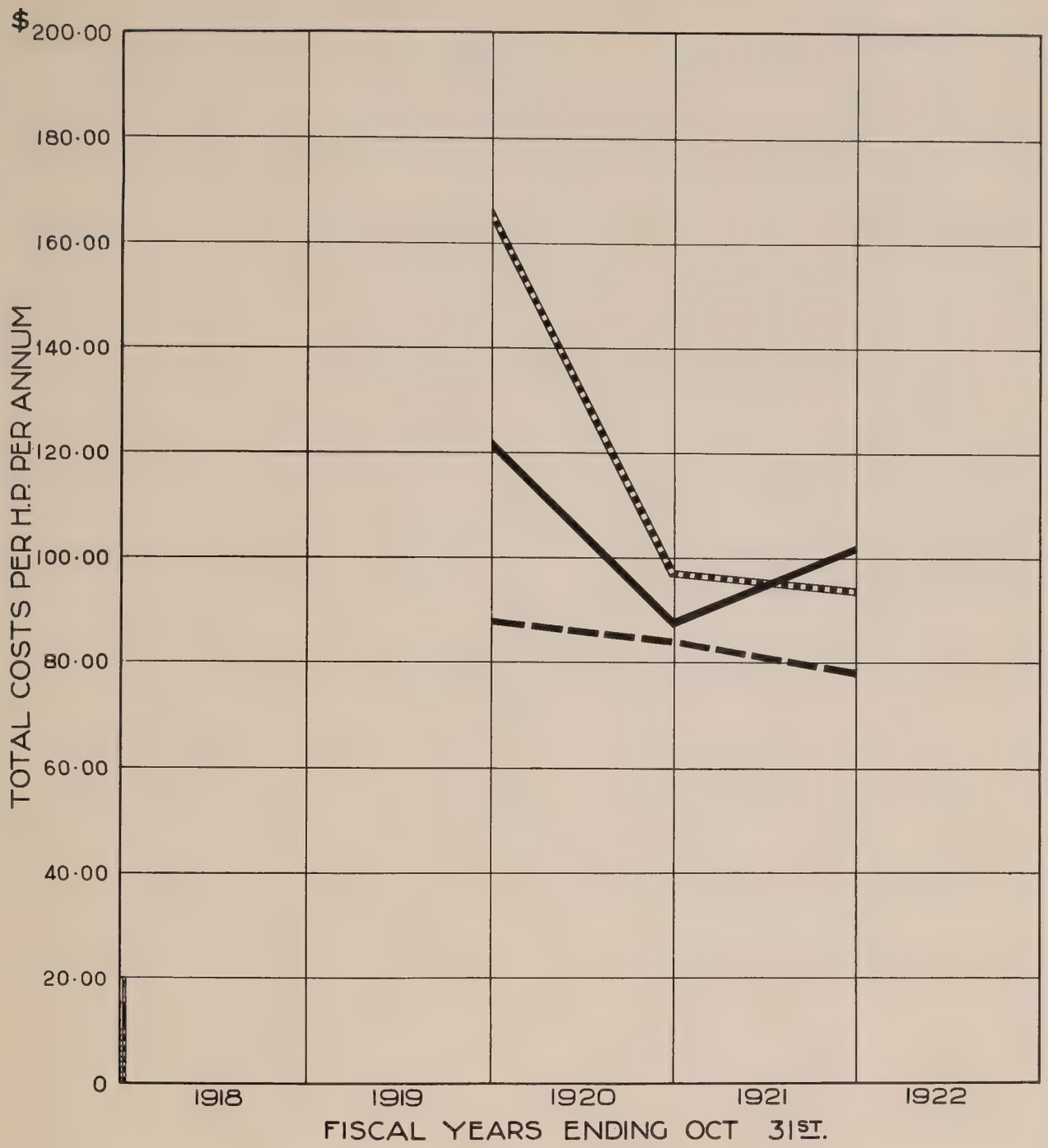
Table of Total Costs per Horse-power per Annum

	Fiscal Years Ending October 31st.		
	1919	1920	1921
H.P. Purchased	[illegible]	$ 97.81	$ 94.38
H.P. Average 12 Monthly Peaks	[illegible]	97.81	94.38
H.P. Maximum Yearly Peak	[illegible]	[illegible]	[illegible]

Table of Subdivided Costs per Annum per Horse-power (continued)

	Fiscal Years Ending October 31st.		
	1919	1920	1921
Power Purchased	$ [illegible]	$ [illegible]	$ [illegible]
Operation	[illegible]	[illegible]	[illegible]
Maintenance	[illegible]	[illegible]	[illegible]
Overhead (all General Expense)	[illegible]	[illegible]	[illegible]
Interest	[illegible]	[illegible]	[illegible]
Insurance	[illegible]	[illegible]	[illegible]
Sinking Fund	[illegible]	[illegible]	[illegible]
Total Costs per H.P.	[illegible]	$ [illegible]	$ [illegible]
Total Expenses per H.P.	[illegible]	[illegible]	[illegible]

The total expenses per horse-power per annum calculated are shown in the table above and on the sheet of curves on page 38.



Costs Per H.P. Purchased Average 12 Monthly Peaks
" " " " Maximum Yearly Peaks
Revenue Per H.P. Purchased

Hydro-Electric Inquiry Commission
W. D. Gregory, Chairman

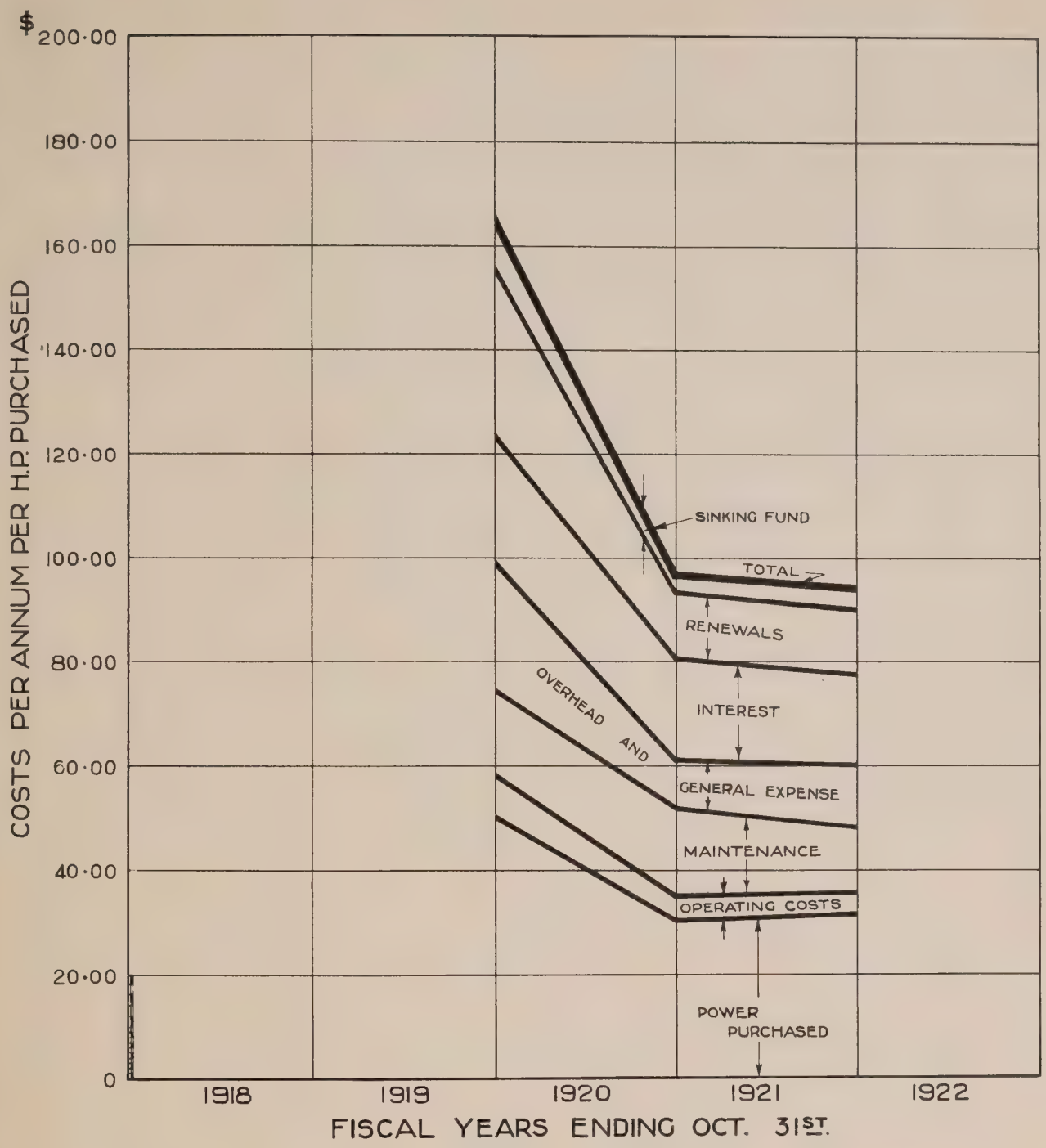
Economics of H. E. P. C. Distribution Systems

Essex System

TOTAL COSTS AND REVENUES PER ANNUM PER H. P.

Toronto, June 11th., 1923. Made by [illegible], Checked by [illegible]

Walter J. Francis & Company
Consulting Engineers



HYDRO-ELECTRIC INQUIRY COMMISSION
W. D. GREGORY, CHAIRMAN

ECONOMICS OF H. E. P. C. DISTRIBUTION SYSTEMS

ESSEX SYSTEM

SUBDIVIDED COSTS PER ANNUM PER H. P. PURCHASED

Toronto, June 11th., 1923. Made by [illegible] Checked by [illegible]

WALTER J. FRANCIS & COMPANY
CONSULTING ENGINEERS

Kilowatt-hour Data and Annual Revenues and Costs per Kilowatt-hour.

No figures are available for kilowatt-hours used on the System, and therefore, no analysis of revenues and costs on this basis can be made.

Summary.

A summary of a number of the more salient points which have been studied and discussed in the foregoing report may be of advantage in continuing the consideration of the economics of the Essex System. They are as follows:

(1) The capital costs of the Essex System contain no charge for generating plants, no charge for main receiving stations and but little for intangible values. They do, however, contain a rather heavy charge for local distributing stations and systems, none of which are owned by the municipalities served. This amount combined with the rather heavy charge for transmission and rural lines makes the total capital cost of the System comparatively high. The load will probably increase gradually and no large increase in capital costs should be necessary to carry it and for this reason it is to be expected that the total capital costs per horsepower will gradually diminish.

(2) It would not appear to be advisable to make any large expenditure of capital at present for the extension of rural lines as these can be expected to bring in but little revenue.

(3) The System is owned outright by the Hydro-Electric Power Commission both as to the power system and the local distributing systems and none of the municipalities served has signed a contract for its supply of power "at cost".

It would appear that an endeavour should be made to have contracts signed by the municipalities and to have the local distributing systems taken over by them. As the finances of the System are gradually being placed on a firmer basis it is probable that the municipalities will become more favourably disposed towards acquiring the local distributing systems.

(4) To facilitate future economic studies and to assist in operating efficiency it would be well to keep accurate records of kilowatt-hours used at the various distributing stations and on the System as a whole.

Kilowatt-hours sold and general statistics for Delta and Kilowatt-hours.

In figures are available the kilowatt-hours sold in the system, and therefore, an analysis of revenues and costs in this basis can be made.

Summary.

A summary of a - system of the more distinct points which have been studied and discussed in the foregoing report may be - be accomplished in analysing the complexities of the municipal in the home system. They are as follows:

(1) The public ownership system contains no charges for generating plants, no charge for [illegible] distribution and but little for transmission plant. The [illegible], nothing a million heavy charge for local distributing stations and systems, many of which are owned by the municipal-ities supply. This leaves [illegible] with the rather heavy charge for transmission and local lines which the local supplies part of the system competitively also. The load will probably increase gradually and as large increase in municipal rates should be necessary to which it and the this reason it is to be expected that the type. Detail data pay across power will gradually diminish.

(2) It would not appear - to be advisable to meet any large expenditure of capital as present for this extension of rural lines as these can be expected to bring in but little revenue.

(3) The system is well supplied by the [illegible] Development both as to the power system and the local distributing systems and none of the municipalities serve the aligned a contract for its supply of power "at cost".

It would appear that an endeavour should be made to have contracts aligned by the municipalities and to have the local distributing systems taken over by them. As the finances of the system are gradually being placed on a firmer basis it is probable that the municipalities will become more favorably disposed towards supplying the local distributing systems.

(4) In facilities future growth should be kept in mind in deciding efficiency it would be well to keep commercial rates of kilowatt-hours used at the various distributing stations and in the system as a whole.

(5) The Hydro-Electric Power Commission is the sole distributor of power in the district and is not competing with any private company. The growth in the load indicates an increasing demand for power which will likely continue for some years at least, as an estimate of the power consumed at present gives a rather low consumption per capita.

(6) The reserve for renewals should be carefully considered in relation to the revised estimated useful life of various portions of the property and also adjusted to allow for the actual cost of money year by year. The point should also be considered whether the reserve should be built up in regard to the full depreciable capital as has been done in the past, or in regard to the twenty-five per cent. of the depreciable capital not covered by maintenance charges.

(7) A sinking fund should be set up in respect to the cash advances made to the System by the Province and the Commission in order that they may be retired when the useful life of the capital assets representing these advances will have passed.

(8) A reserve for contingencies should be set aside to cover loss from catastrophe, bad debts, etc. If necessary the cost of power might be increased slightly to allow for setting aside additional reserves for sinking fund and for contingencies.

(9) Power will undoubtedly continue to be supplied from the Niagara System and there does not appear to be any other feasible source of supply. Such being the case, it would seem advisable to merge the Essex System with the Niagara System at some future date when that course will have become practicable.

Walter J. Francis
Consulting Engineer.

Toronto, June 11th, 1923.

Copy for enclosure to Mr. J. Allan Ross.

(4) The Sydney-Glace Bay Development in the area concerned of power in the Atlantic and is not competing with our private industry. The growth in the Iron Industry is increasing demand for power using will create conditions for more power to Sydney, as an estimate of the power necessary given a boost the consumption per capita.

(5) The remarks Dr. Connolly seems to indicate, somewhere in relation to the vertical principal would lift or further reducing of the property and also expected to close for the longer part if there pick up work. The point should also be considered "Power vs. property" should be built up to repay or the full depreciation capital as has been done in the past, or be repaid to the Provincial-City and Sydney, if the interprovincial capital not covered by maintenance charges.

(7) A study that would be worth is an inquiry as the part economy made to the figures by the Provincial and the possibility is great that they may be retired when the capital life of the Sydney Power Corporation Ltd. will have passed.

(8) I realize the [illegible] to not yields to serve like Iron [illegible] the [illegible] power or power which is [illegible] to allow the Sydney Steel Corporation [illegible] the [illegible].

(9) Power will [illegible] is to supplied from the Sydney Steel [illegible] Power [illegible] to [illegible] Sydney [illegible] to [illegible] the Sydney Steel with the Sydney Steel [illegible] Power [illegible] will have [illegible] possibility.

Sincerely yours,

Toronto, June 11th, 1947.